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FOOD ENGINEERING

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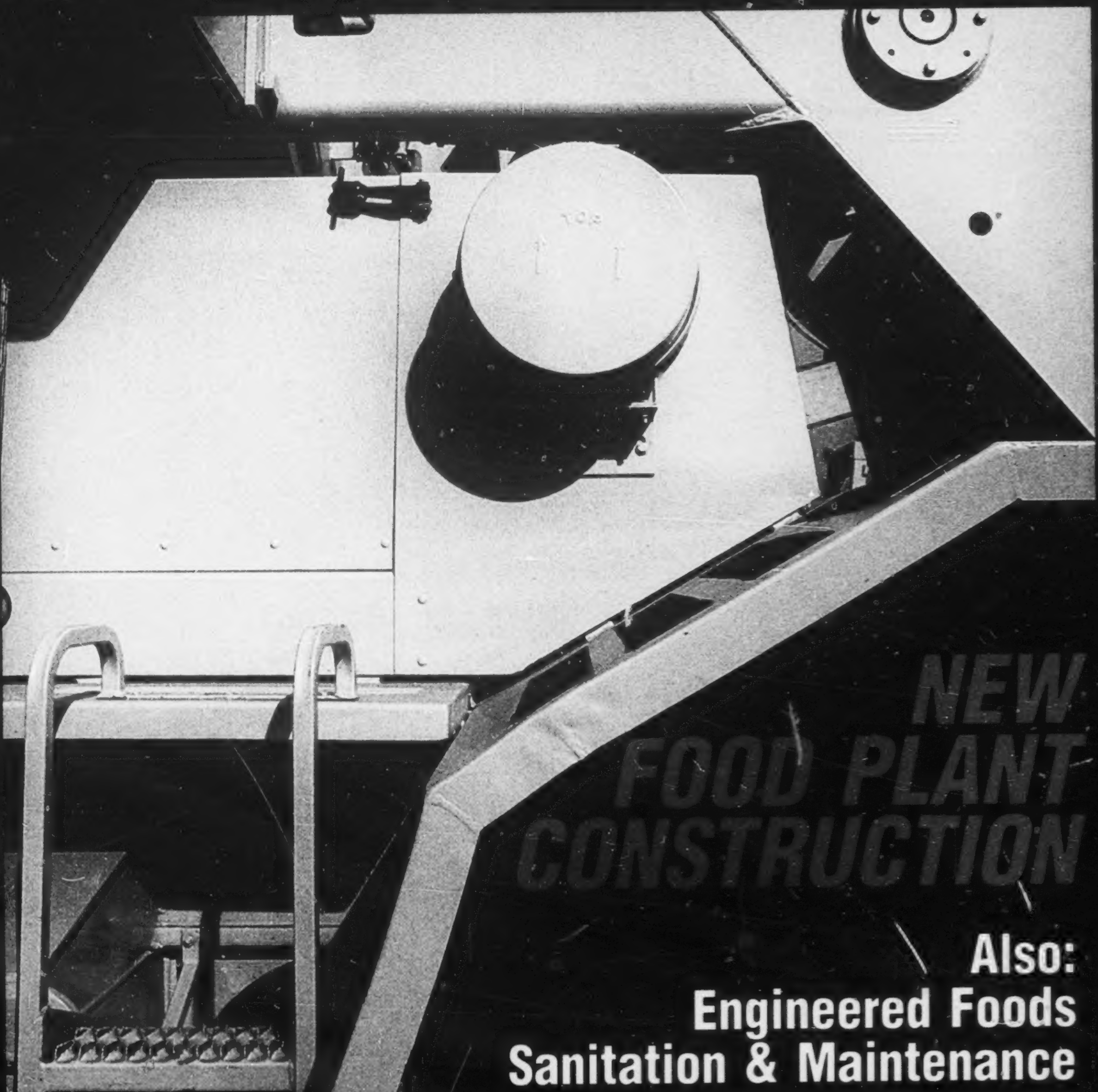
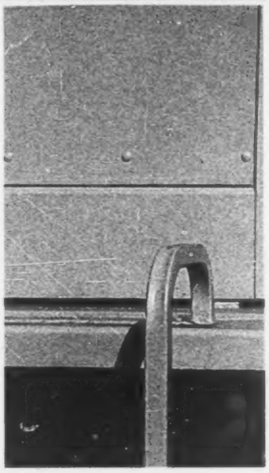


NEW FOOD PLANT CONSTRUCTION

Also:
Engineered Foods
Sanitation & Maintenance



COVER STORY

Our ninth annual New Food Plants Survey offers a detailed listing of who in the food industry is building, renovating or expanding and where it is taking place.

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News

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This month's Report discusses a projected increased use of machine vision in the food and beverage industry, reflecting the strong requirement for high quality and virtually non-existent contamination; a discussion of RJR Nabisco's objectives by Chairman and CEO, J.Tylee Wilson and President and COO F. Ross Johnson; the 1986 Novo Biotechnology Award has been presented; a report on product code dates; and corporate news from the industry.

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ALL NATURAL
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MOUSSE DESSERT

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Features

67 New Food Plants

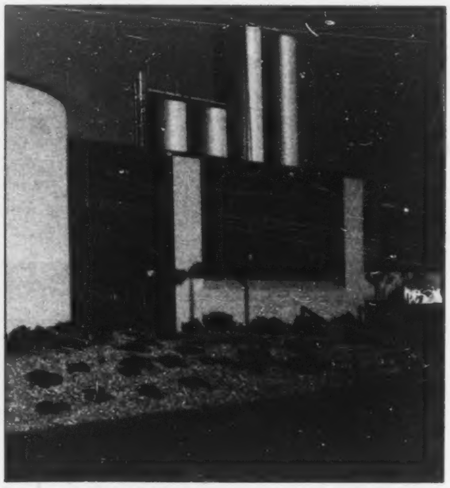
This year's new food plant survey, the ninth of its kind by Food Engineering, tracks who is building what. . .and where. More than 330 plants are listed, showing how active the industry has been in renovating, expanding and constructing facilities.

91 Site Selection

What criteria does the food industry apply when deciding whether to build, expand or renovate? Several food companies discussed with FE how they made the decisions they made, and why.

99 Sanitation Troubleshooting

Sanitation experts have shared with FE some ways to avoid sanitation problems. This troubleshooting guide will help you to pinpoint your problems and show you ways to avoid them in the future.



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CHILTON
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Ralston Purina assembled a roundtable of food industry experts to discuss the recent report on recommended dietary protein intakes. This roundtable summary, an exclusive to FE, covers the discussion surrounding the implications of the report.

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This new high maltose sweetener (65 percent maltose, less than 4 percent dextrose) offers stability, clarity and reliability.

60 Oleic Acid Oils
Increased demand for oils high in oleic acid content results from recent studies relating them to reduced blood cholesterol levels.

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"New generation" gum-arabic substitute forms stable flavor emulsions under refrigeration and in alcohol, forms clouds.

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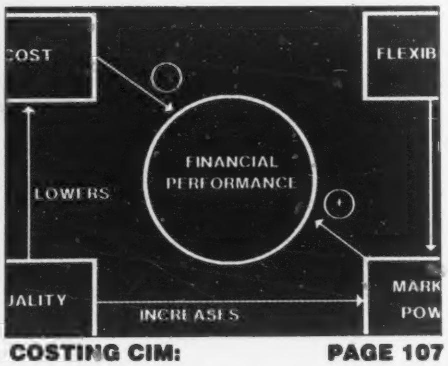

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Special Emphasis

PINPOINTING SANITATION PROBLEMS:

This month we went to industry experts in sanitation to determine how to pinpoint sanitation problems and how to avoid them.

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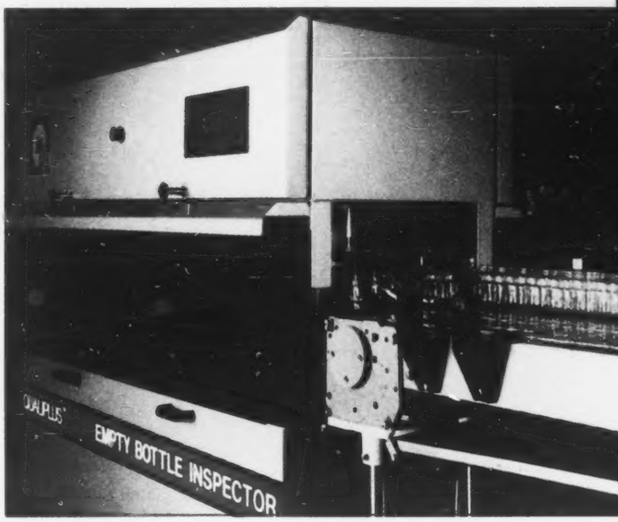
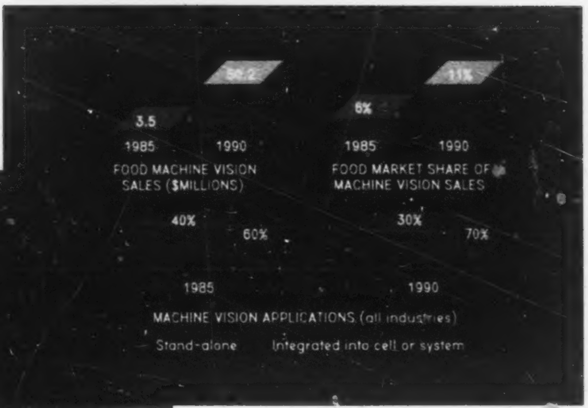
Food and beverage producers increase use of machine vision in an effort to protect product purity





The use of machine vision for inspection, gaging, process control and sorting in the food industry is expected to increase dramatically over the next five years, according to a study by the University of Michigan. The focus of machine vision is also expected to shift from stand-alone systems, performing a single on-line task, to integrated systems, tied to a central computer.

Motivated largely by its concern for product purity, the U.S. food and beverage industry will nearly double its use of machine vision inspection by 1990, concludes a report titled, "Machine Vision: Delphi Forecast to 1990,"conducted by the University of Michigan.

As of 1985, food and beverage producers were estimated to have invested $3.5 million in six percent of vision units purchased in the United States. That market share will increase to 11 percent, or $50.2 million, by 1990, according to the study. Food and beverage manufacturers will thus maintain a third place position behind the automotive and electronics industries, as major purchasers of machine vision units.

Expert panelists

The University's Industrial Development Division of the Institute of Science and Technology surveyed experts from the business and academic sectors for the report. Aside from inspection, panelists cited process control, sorting and gaging as the most promising applications of machine vision in the food and beverage industry. In consideration of these responses, the report said, "These applications reflect the strong requirement for high quality and virtually non-existent contamination in food and beverage items, both after production (inspection and gaging), and during (process control and sorting)."

The definition of what constituted a machine vision unit utilized by the study was one supplied by the Automated Vision Association: "Devices used for optical non-contact sensing to receive and interpret automatically an image of a real scene in order to obtain information and/or to control machines or processes."

The panelists agreed that the food industry will be the largest consumer of color vision. Color detection for quality control ranked only behind data processing speed for interest.

Algorithms, or problem-solving formulas, high-speed inspection and software were identified by panelists as vital topics of investigation to the food and beverage industry.

According to the study, the food industry will rely on x-ray scan equipment, video scan, and, to a minor extent, infrared and laser scan.

Forecast highlights

- Domestic sales of machine vision systems are expected to grow at rates between 50 and 82 percent per year, to an annual figure of approximately 15,000 by 1990.
- By 1990, some 70 percent of machine vision units are expected to be tied into an integrated cell or system.
- Depending on application, the cost of a typical basic machine vision unit is expected to range between $25,000 and $50,000 at present, falling to the range of $15,000 to $35,000 by 1990.
- While video will remain the predominant type of image sensor (80 percent in 1985, down to 64 percent by 1990), laser scanning is anticipated to increase significantly, from 10 percent to 22 percent over the forecast period.
- By 1990, 15 percent of all vision units will be equipped to utilize color.
- While only 5 percent of present vision units can perform three-dimensional analysis, that number for 1990 is predicted to be 30 percent.
- The most important technical barriers to more extensive use of machine vision in industry include: insufficient computational power, inadequate processing speed, and limitations in software. Other potential difficulties included camera technology limitations, illumination limitations and system reliability and durability.

Further information on the study is available from The Automated Vision Association, P.O. Box 3724, Ann Arbor, MI.

Higher suggested dietary intakes of...

Protein

A recent FAO/WHO/UNU report recommends a new approach for estimating human protein requirements.

After the Food and Agriculture Organization (FAO), the World Health Organization (WHO), and the United National University's (UNU) report altering the recommended dietary protein intakes was released in late 1985, Ralston Purina Company assembled a roundtable of food industry experts (see box in center) to discuss the implications of the report. Those implications cover a wide spectrum of industry concerns including regulation, consumer health, labeling, the rapport between the scientific and academic communities, and, last but not least, new product development and the economics of finished food manufacturing. We thought you might want to listen in on what was said.

Participants, Ralston Purina Roundtable on Dietary Protein Intakes

Howard Bauman, Ph.D.
Pillsbury Company

Phyllis E. Bowen, R.D., Ph.D.
University of Illinois, Chicago

Robert Bursey, Ph.D.
Kraft, Inc.

Paul Hopper, Ph.D.
General Foods

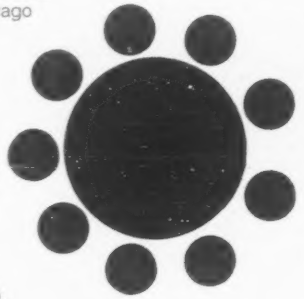
Charles Kolar, Ph.D.
Ralston Purina Company

Gilbert Leveille, Ph.D.
Nabisco Foods

Clyde Stauffer, Ph.D.
Cereal Foods World

Frederick Steinke, Ph.D.
Ralston Purina Company

Vernon Young, Ph.D.
Massachusetts Institute of Technology



Moderator: Could someone provide us with an overview of the World Health Organization's report?

Young: The FAO/WHO/UNU report recommended using a different approach to estimate human protein requirements than were suggested in a previous report released in 1973 by FAO/WHO. The new report states that the most appropriate approach in defining the protein requirements of man is to depend, as much as possible, on results from direct nitrogen balance studies.

This tends to result in higher recommendations than were made in 1973. For example, for healthy adults, the 1973 recommendations for a safe protein intake (one sufficient to meet the requirement for essential amino acids as well as total nitrogen) was approximately 0.6 grams per kilo per day of high quality protein. The 1985 recommendation is 0.75 grams per kilo per day. Balanced against this increase are changes in the recommendations concerning adjustments for differences in protein quality.

Another aspect of this report that differentiates it from the 1973 report is four amino acid patterns have been proposed as contrasted with the single pattern that was used in 1973. These four patterns are age-related. So, depending on the age group, a specific pattern of amino acids can be utilized for purposes of evaluating the capacity of the food protein sources to meet the requirements for the nutritionally essential amino acids.

The earlier recommendations for sulfur amino acids per unit of protein was 35 milligrams per gram of crude protein. But in the preschool group, the new report proposes the concentration be reduced by about a third, or to 25 milligrams per gram of protein. And this has significant implications with respect to predicting protein quality and those protein sources that might be thought to be limiting with respect to sulfur amino acid content.

Another aspect of the report which is important is that the data base used to define the protein and amino acid needs of man is principally from studies that have been carried out directly in humans, with very little reference to studies that have been conducted in

(Continued on page 52)

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non-human models. Rat data can be useful, however, particularly in the context of providing an index of digestibility. And the point is made that the only important protein quality component – in terms of normal diets in adult humans – is the issue of digestibility. The protein efficiency ratio (PER) is not an appropriate standard for precise prediction of human nutritional benefit.

Leveille: The criticism levied against the 1973 report is that by virtue of a scientific interpretation we have, in effect, wiped out protein deficiency in the less developed world. Clearly this new report will change that interpretation and, in fact, indicate an even greater need for protein.

Young: Insofar as the U.S. food industry is concerned, these changes have importance with respect to how the nutritional value of different food protein sources should be compared. Current regulatory procedures are inadequate for at least certain protein sources and tend to provide an inadequate prediction with respect to the capacity of these proteins to meet human requirements.

Moderator: What labeling regulations changes might be necessary?

Leveille: The most obvious one is the regulation which now requires that protein be labeled (or quantified) on the basis of its PER value. In effect proteins that have a PER in the range of 2.5 can be labeled on the basis of a 45 gram requirement; whereas if the PER is lower than that, a 65 gram requirement is used. If the FAO pattern was utilized, many proteins for which the 65 gram standard must now be utilized could be labeled on the basis of a 45 gram figure. This obviously applies to most plant proteins.

Steinke: That is about a 44 percent difference and would have a great significance for food manufacturers.

Young: On the basis of the work that has emerged over the last ten years, it has been shown that some vegetable protein sources perform much better in man than in the rat. And since the regulatory procedures are based at present on rat assay approaches, this has significant negative impact on the apparent ability of a plant protein source to meet given physiological needs in humans.

Dr. Gilbert Leveille of Nabisco Foods, Dr. Vernon Young, Massachusetts Institute of Technology, and Dr. Frederick Steinke of Ralston Purina were among those who met to discuss the implications of a FAO/WHO/UNU report on human protein requirements.

Moderator: Who should take the lead in trying to change regulations?

Leveille: It is important to recognize the difficult position industry representatives are placed in, since it appears we have a vested interest.

Hopper: We have to divide the problem into several pieces because there is no universal answer. With regard to science, there are some very definite and positive things the scientific community should take the lead in. It should provide the basis upon which the regulatory agencies can make the change without undue criticism.

As far as standards are concerned, there are powerful lobbies resisting those changes. This is an issue that needs to be dealt with a little bit at a time. The industry should be taking the lead here.

Regarding the protein situation, a task force consisting of people from the American Society of Clinical Nutritionists and other groups should be formed. They could come up with a white or position paper that lists things that the scientific community feels should be done to improve the well-being of the population.

Bauman: We have made a small move in the right direction by allowing the use of cheese substitutes rather than calling them imitation. But we need to go further than that.

Young: The recommendations made in this report are basically generated from studies that have been carried out directly with different food protein sources. The results of those studies were entirely predictable on the basis of the amino acid profile of the diets that were used in the experiments and from a knowledge of the protein digestibility. So for foods and protein sources for which reasonable data exist, an amino acid profile – determined by the appropriate methodology coupled with an estimate of digestibility – would be a predictor of the performance of that food when consumed by people. For radically different or new food protein sources, there is a need to generate data initially in a non-human model and then extend it into direct human studies.

Bowen: Since processing food can reduce the bioavailability of the amino acids present, perhaps with more specific chemical techniques now available we can sort out these changes and specify the quantities of each amino acid.

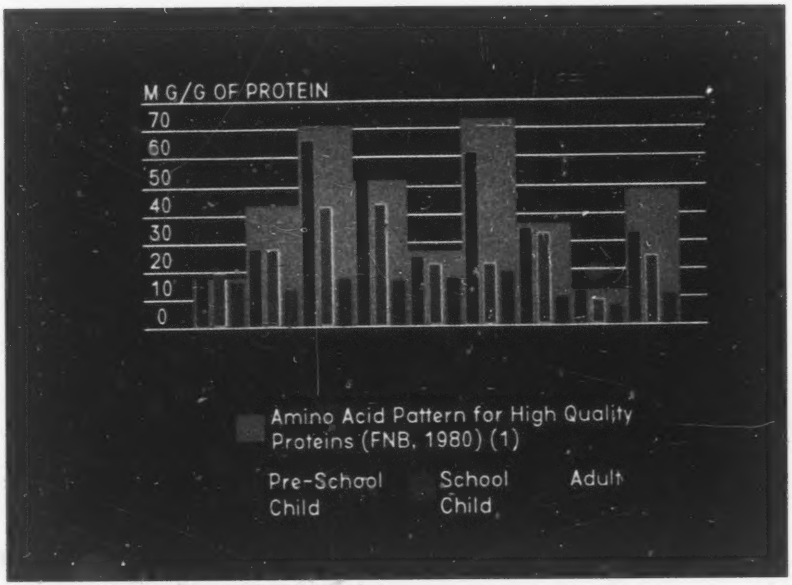
Moderator: Will the WHO report have any effect in improving diets in the United States and developed countries, and will the consumer have a better conception of soy protein?

Bauman: It might have some effect on the school lunch program and a few others. As far as the use of isolated soy protein, we have certainly not seen much reaction from consumers. The only time consumers reacted to soy protein was when the taste was not what they thought it should be. But as long as the flavor is there, they are not as concerned what protein they are using. In fact, vegetable proteins may have greater appeal than animal proteins to many consumers.

Stauffer: In working with clients we do not formulate to match amino acid patterns; rather we formulate from a functionality standpoint. Food products need a particular structure – amino acid makeup is secondary.

Kolar: You have to make food products that are highly acceptable, but with the constraints that we have today it is sometimes difficult. Regulations based on amino acid requirements would put things on a more realistic basis.

Bauman: Proteins ought to be permitted much as fats and sweetener substitutes can be used. This would open up more choices within a class of foods.



Recommended amino acid patterns for three age groups are compared to amino acid pattern of a high quality protein.

Bowen: As we become more convenience food-centered – especially in the U.S. – food manufacturers make more choices for people. Therefore, we have to make sure a wide range of options remain.

Steinke: Food patterns have changed in the last twenty years – there is a drive from consumers towards healthy foods. We now have to accelerate the manufacturers' capabilities of meeting these demands to provide healthy foods that are acceptable to consumers.

Moderator: What is the importance of this report in meeting dietary goals to help reduce the occurrence of chronic diseases?

Steinke: We have actually developed a number of food and prototype food products – particularly in the meat and cheese areas – using isolated soy proteins. For example, the fat content of frankfurters can be cut by 50 percent by using isolated soy proteins. If you consumed a 100 gram serving twice a day of these products, you could reduce the fat content from 40 percent of calories consumed to 30 percent. And other modified food products can be developed which reduce fat consumption by 30 to 35 grams per day.

Hopper: When we talk about formulating a food to cure a disease, the whole issue of health claims has to be made based on the total dietary intake and not on the composition of any given food.

Steinke: The food industry has a charge from the National Institutes of Health (NIH) to develop new food products to meet the national goal of

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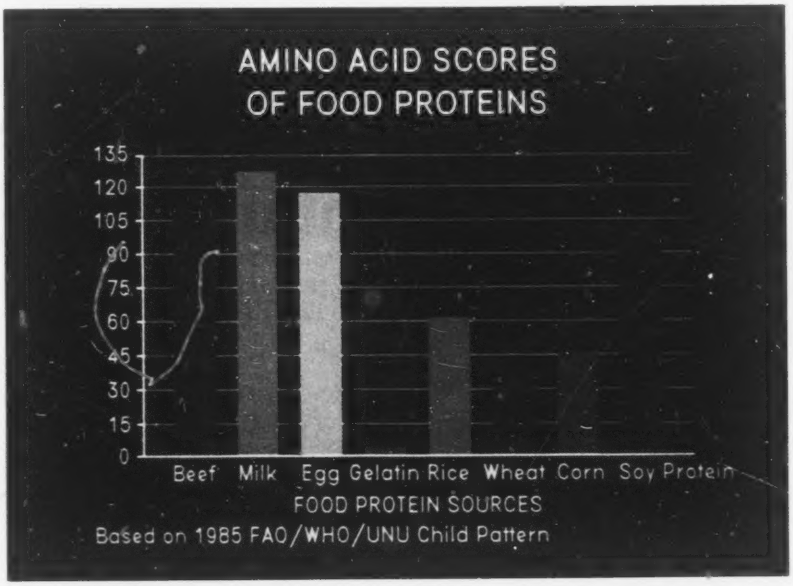
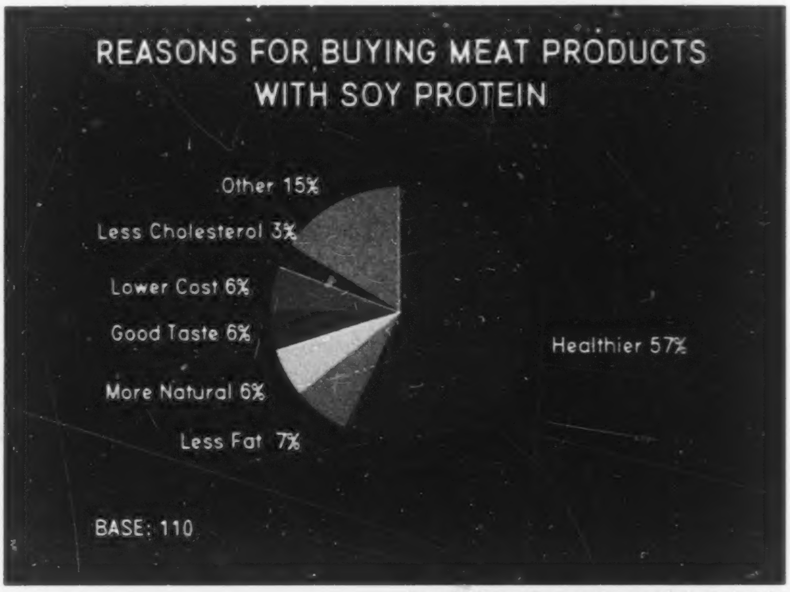


These amino acid scores of food proteins are based on the 1985 FAO/WHO/UNU recommendations for preschool children.



In addition, consumers are interested in meat products with soy protein because they perceive them to be "healthier."

(Continued from page 53)

reduced fat and calories in food products. One of the ways that can be done is by using new food ingredients. But in order for them to be used, we have to have regulations based on human requirements which allow those ingredients to be incorporated into foods and labeled in such a way that will not turn people off.

Moderator: Could someone describe some of the new applications of isolated soy protein?

Kolar: Isolated soy proteins can be used in meat products such as sausages for reduced fat, calories, and cholesterol. They can also be used in non-dairy yogurt products or in nutritious beverages.

Leveille: It is important to focus on the four fundamental ways in which a source of protein such as this might be used. These are: For fortification; in analog foods; as functional protein ingredients; and in the engineering of totally new foods.

Kolar: One new food that has been on the market for a while now is frozen non-dairy desserts which seem to have created a niche in the market.

Moderator: What opportunity exists for entirely new foods?

Steinke: A lot of flexibility exists with soy proteins of different functional characteristics. This creates much potential in developing new food products.

Hopper: In looking at today's trends and demographics, there is more and more food eaten away from home, more frequent meals, and more snacking. This tends to create new products in and of themselves – things that can be eaten out of hand which are shelf stable. These are the type products where ingredients such as soy isolates certainly have a place.

Bursey: There was a generation of youngsters who were exposed to large quantities of soy through the school lunch program before all of the acceptability issues were totally resolved. Do you sometimes get a sense from this generation that because of the bad experience with soy replacement in hamburgers and other foods in school lunch programs, they have some sense of rejection of soy-containing products?

Kolar: We conducted some consumer research about people's attitudes towards soy proteins in food products. The results indicate that people are willing to accept soy proteins in food products and find them as a healthy and acceptable alternative to meat.

Steinke: The real kickback came in 1972 and 1973 with unacceptable products in the grocery store. You need a period of time to get over that and that time has passed.

Moderator: How does the cost of isolated soy protein compare with other sources of protein?

Kolar: Let's take a hypothetical situation. Say we were going to make a nutritional bar with 25 percent of the

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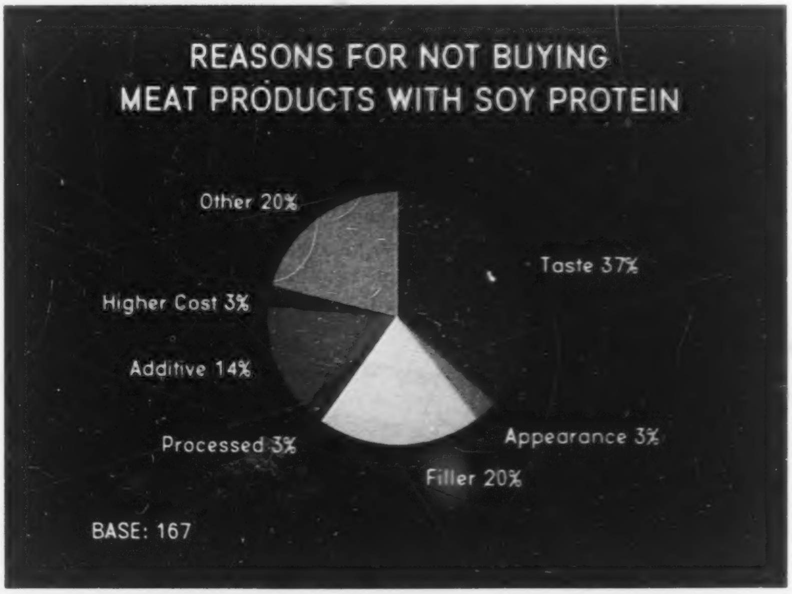

Results of a nationwide survey suggest that soy protein be used properly so that taste is not adversely affected.

Continued from page 56

RDA for protein. We decide that the PER should be 2.5 in order to use 45 grams as the basis of RDA calculations so we use casein because it has a PER of 2.5. Casein historically fluctuates highly in price.

The alternative would be to use isolated soy protein as a protein source. However, based on present regulations, we would have to use 65 grams since the PER is 1.8. Therefore, we would have to use several more grams of protein. This means two things: You may not be able to make as acceptable a product with increased protein, but if you could, it would cost more to make that product if casein and isolate were the same price.

Now, based on this new report, isolated soy proteins could be used at the same level as casein. There are times when isolate is 30 to 40 percent less expensive than casein. Milk proteins on a protein basis in the U.S. are two and a half to three times as costly as isolated soy protein, except casein.

Leveille: Isolated soy protein would be viewed as an alternative protein that would be utilized relative to its functionality and price.

Moderator: Any closing comments?

Steinke: The amino acid composition of isolated soy protein is certainly comparable with other standard proteins as far as humans are concerned. It offers the opportunity of a protein that can be widely used in many food products, and has the capability of being modified or changed to provide functional characteristics that can be used in a variety of foods.

Bursey: The demands that are being placed on the food supply in terms of meeting both real and perceived needs of the consumer as we move into the 21st century will require that certain issues, like convenience, become major product thrusts. New ingredients such as soy isolate can provide opportunities as well as new challenges for the food industry.

Hopper: The report indicated that the required estimates relate more closely to individuals than to populations. Nutrition is a young discipline. The ability to provide a broader spectrum of protein sources is an important dimension for the food industry.

Bauman: If we intend to get regulations changed concerning vegetable proteins, we need to reach a far wider audience than just talking to various societies. Things will move a lot easier through Food and Drug if the consumer is aware that vegetable proteins are good quality proteins.

Kolar: There is potential for significant change if the new informations on protein requirements can be carried through in terms of regulations. This will allow the food industry to take advantage of the new information by producing new food products acceptable to consumers.

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1986
PLANT CONSTRUCTION SURVEY

Who's building what, and where? Food Engineering's ninth annual look at new construction reveals all.

Food Engineering's ninth annual New Plants Survey—compiled from studies conducted by Conway Data, Inc. (Norcross, GA) and *Food Engineering*—reveals a record 332 new and expanded food plants completed or under construction during the past year, well up from 295 last year and dramatically up from the 201 plants reported in 1984.

Probable major reason for the two year surge in spending for new food plants: Falling interest rates. As of September 30, the prime rate stood at 7.5 percent, down 2 percent from a year ago and a full 5 percent from mid-1984.

Interestingly—just like last year—half (173 of the 332 plants surveyed) are expansions or renovations of existing plants, half are new construction.

A brief study of the following pages generally reflects current food industry trends but contains a surprise or two. Two unexpected revelations. First, as Sunbelt construction continues at a high level, the "Rustbelt" is fighting back (partly because of the initiatives that Rustbelt states are taking to bring industry back, and partly because of the concentration of research and educational institutions in these states). Second, an apparent "bakery boom." This year, 28 plants in the total survey are bakery plants (not including cookies), compared to only six last year.

Trends confirmed include:

- The snack food surge: No less than 32 plants—nearly 10 percent of the total—are snack food and cookie plants.
- Convenience foods: A score of ready-to-eat and heat-and-serve products produced in many plants can be classified as "convenience foods," but the trend is especially apparent in the fact that 31 plants are described as "prepared foods" or "frozen food" plants.
- Low fat/low cholesterol: This year, 23 new or expanded poultry plants are listed, on top of last year's 21.

In the following tables, "Site/Size" lists either site acreage or square footage of new plants where known, or indicates expansions/renovations if not a new plant. "Status & Date" refers to project status and date reported.

(Continued on page 68)

CHARLES. E. MORRIS
Midwest Editor

1986

PLANT CONSTRUCTION SURVEY

A

Company	Plant Location	Primary Product	Square Feet/cap.	Est. Cost ($-million)	Employ-ees	Architects Engineers	Status & Date
Ace Tomato Co.	San Joaquin, CA	Canned Veg.	Expansion	-	-	-	Planning 11/85
Adolph Coors Co.	Harrisonburg, VA	Beer	344 acres	70	1700	-	Construction 10/85
Advanced Foods	Iowa Falls, IA	Prepared Foods	-	-	23	-	Planning 8/86
AG Dynamic Syst.	Goodland, KS	Proc. sun seeds	3 acres	1.2	20	-	Construction 7/86
Agri-General	Kenova, WI	Proc. eggs	-	0.9	55	-	Planning 6/86
Algood Food Co.	Louisville, KY	Peanut but./Prune Juice	-	1	26	-	Reported 10/85
All Amer. Gour met	Salt Lake, UT	Frozen Foods	-	-	300	-	Planning 12/85
Allison Cookie	Plant City, FL	Cookies	-	4.5	150	-	Planning 11/85
Alpha Coffee Co.	Chicago, IL	Coffee	-	-	-	-	Planning 12/85
Alpo	Pascagoula, MS	Pet food	-	-	-	Daniel Int'l	Reported 10/86
American Fructose	Dimmit, TX	Corn syrups	Expansion	4	121	-	Planning 8/85
American Packing	Durant, OK	Meat products	Expansion	-	50	-	Construction 5/86
American Potato	Moses Lake, WA	Pinto Beans	-	5.4	39	-	Construction 9/85
American Rice	Freeport, TX	Milled rice	20 acres	50	300	-	Construction 11/85
American Seaway	Bedford Hts., OH	FF whse.	Expansion	1.2	-	-	Construction 11/85
Anheuser-Busch	Columbus, OH	Beer	Renovations	-	-	MK-Ferguson	Continuing
Anheuser-Busch	Ft. Collins, CO	Beer	1.3MM sq. ft.	300	-	MK-Ferguson	Completion '88
Anheuser-Busch	Houston, TX	Beer	Expansion (550Msq.ft)	-	-	MK-Ferguson	Completed 4/86
Anheuser-Busch	Los Angeles, CA	Beer	Renovations	-	-	MK-Ferguson	Startup 5/87
Anheuser-Busch	St. Louis, MO	Beer	Renovations	-	-	MK-Ferguson	Continuing
Anderson Clayton	Jacksonville, IL	Edible oils, prepared fds	-	-	-	-	Planning 9/85
Aquaculture Prod.	Greenwood, MS	Catfish	Expansion	3	49	-	Planning 9/85
Arizona Products	Yuma City, AZ	Canned citrus	Expansion	5.1	140	-	Planning 1/86
Armour Foods	Springfield, KY	Cheese,butter,dried milk	Expansion	2	30	-	Planning 6/86
Atlantic Food Service	Prince Wm. City, VA	Prepared foods	-	8.3	-	-	Planning 11/85
Autocrat Co.	Lincoln, RI	Flavors,coffee-rel. pd	5 acres	-	-	-	Planning 11/85
Avalon Baby Foods	Sutter, CA	Frozen baby foods	Expansion	-	-	-	Planning 11/85
Azteca Milling	Edinburg, TX	Corn flour	Expansion	6	-	-	Completed 11/85

B

Barq's, Inc.	Biloxi, MS	Soft drinks	Expansion	-	-	-	Reported 10/85
Bar-S Foods	Clinton, OK	Lunch meats	Expansion	1	40	-	Reported 8/85
Bar-W Meat/Poultry	Ft. Worth, TX	Process Meats	-	2	30	-	Planning 7/86
Basic Veg. Prods.	Hanford, CA	Garlic, onion	10 acres	-	55	-	Construction 1/86
Beatrice	Sylvester, GA	Peanut butter	-	-	100	-	Planning 8/86
Beatrice	Mayville, WI	Cheese pkg.	-	-	200	-	Completed 11/85
Beckman Produce	Beloit, WI	Prepared fds.	-	1	20	-	Planning 9/86
Bell Brands	Santa Fe Springs, CA	Corn, potato chips	166M sq. ft.	13.6	-	Austin Co.	Reported 9/86
Best Foods	Ashbough, NC	Soup, sauces	-	-	-	Daniel Int'l	Reported 10/86
Bev-Pak	Glenville, NY	Soft drinks	Expansion	1.2	40	-	Planning 12/85
Big Stone Cheese	Big Stone Cty, SD	Cheese	Expansion	1.5	10	-	Planning 11/85
Bil Mar Foods	Zeeland, MI	Turkey proc.	-	40	-	-	Construction 9/85
Bitesized Candies	Casey, IL	Candy	25 acres	2	275	-	Planning 12/85
B.K. Foods	Gadsden, AL	Proc. chicken	15 acres	2.5	100	-	Construction 8/86

1986 PLANT CONSTRUCTION SURVEY

Company	Plant Location	Primary Product	Square Feet/cap.	Est. Cost ($-million)	Employ-ees	Architects Engineers	Status & Date
Borden	Austin, TX	Milk	50M sq. ft.	-	-	Daniel Int'l Hixson	Completion 3/8
Borden	Tallahassee, FL	Dairy prod.	3 acres	35	60	-	Planning 6/86
Brookshire Groc.	Tyler, TX	Dist. ctr.	Expansion	6.5	-	-	Construction 9/86
Broome City Meat	Sanford, NY	Meat packing	-	13	175	-	Planning 11/85
Burger King	Aurora, CO	Dist. ctr.	8 acres	-	-	-	Planning 2/86
C							
Cadco	Urbandale, IA	Soybean oil	Expansion	1.5	-	-	Planning 11/85
Cagle's	Atlanta, GA	Prepared foods	Expansion	3	150	-	Construction 4/86
Caldwell Sugar	Thibodaux, LA	Molasses	Expansion	1	55	-	Construction11/85
California Cooler	San Joaquin, CA	Beverages	Expansion	-	-	-	Planning 11/85
Calistoga	Napa, CA	Mineral water	Expansion	-	-	-	Planning 11/85
Campbell Soup	Camden, NJ	Canned foods	Renovation	37	-	-	Completion 1989
Campbell Soup	Marshall, MI	Refrig. soups/ sauces	Exp. (12Msq.ft)	2.9	15	-	Completed 1/86
Campbell Soup	Stanislaus, CA	Soup	Expansion	-	-	-	Planning 11/85
Cargill	San Bernardino, CA	Grain milling	Expansion	-	-	-	Planning 11/85
Cargill	Montezuma, CA	Poultry Prod.	-	30	-	-	Planning 6/86
Caramagno Foods	Detroit, MI	Warehouse	-	1.5	-	-	Planning 1/86
Carnation Co.	Othello, WA	Potato proc.	Expansion	18	60	-	Construction 4/86
Carolina Turkeys	Garner's Chapel, NC	Turkey prod.	700 acres	20	1,000	-	Construction 9/85
Castle & Cooke	Waikele, HI	Canned pineapple	Expansion	50	-	-	Planning 9/85
Cathay Foods	Joliet, IL	Soy sauce, tofu	10 acres	-	45	-	Construction 4/86
Cent.IL Snack Food	Springfield, IL	Potato Chips, snacks	4 acres	1.1	40	-	Completed 10/85
Central Okla. Fds.	Ft. Gibson, OK	Soft drinks	Expansion	-	56	-	Completed 11/85
CFS Continental	Stockton, CA	Buns	-	8	-	-	Completion 12/86
Chef Pierre	Forest, MS	Frozen bakery	Expansion	5	125	-	Completed 11/85
Chung Bo Foods	Trenton, MO	Chinese foods	-	-	20	-	Construction 1/86
Circle A Packing	Harper, KS	Meat packing	Expansion	1.2	40	-	Planning 2/85
Clark Candy Co.	Pittsburgh, PA	Candy bars	80M sq. ft.	-	80-100	Siebert Eng.	Startup 10/86
Coca-Cola	Anapolis, MD	Coca-Cola	Expansion	9.8	8	-	Completed 5/86
Coca-Cola	Portland, OR	Soft drinks	-	10	-	-	Planning 12/85
Coca-Cola Btlg.	Cincinnati, OH	Coca-Cola	Expansion	12	-	-	Construction 9/85
Coca-Cola Btlg.	Jackson, MO	Coca-Cola	Expansion	1.6	10	-	Completed 12/85
Coca-Cola Btlg.	Louisville, KY	Coca-Cola	Expansion	1.0	-	-	Planning 6/86
Coloma Fzn. Foods	Hagar Twnshp, MI	Frozen foods	Expansion	1.5	7	-	Construction 9/85
ConAgra	Milford, DE	Poultry proc.	Expansion	-	150	-	Planning 1/86
Concord Farms	Concord, NC	Poultry (ducks)	Expansion	4.3	-	-	Planning 11/85
Consolidated Bev.	Orange, CA	Liquor whse.	Expansion	-	-	-	Planning 11/85
Contadina Foods	Hanford, CA	Dist. ctr.	Expansion	1.2	-	-	Completed 9/86
Cookie Baron	Salem, OR	Baked prod.	-	-	40	-	Planning 11/85
CPC Int'l	Argo, IL	Corn wet milling	Expansion	-	-	Daniel Int'l	Phase 2 comp. '86
Cosby Hodges	Ocala, FL	Pet foods	7 acres	1.5	40	-	Construction11/85
Cracker Jack	Northbrook, IL	Caramel corn	60M sq. ft.	-	150	Siebert Eng.	Startup 7/86
Crane Potato Chip	Springfield, IL	Potato chips	-	-	-	-	Planning 12/85
Creative Foods	Amboy, IL	Prepared foods	-	-	50	-	Planning 11/85
Cream O'Weber	Salt Lake, UT	Dairy products	-	-	-	-	Construction 9/85
Cuba Cheese	Cuba, NY	Cheese	Expansion	13	40	-	Planning 12/85

(Continued on page 72)

1986 PLANT CONSTRUCTION SURVEY

Company	Plant Location	Primary Product	Square Feet/cap.	Est. Cost ($-million)	Employ-ees	Architects Engineers	Status & Date
D							
Daily, Inc.	Missoula, MT	Sliced bacon	Exp. (8M sq. ft.)	1.2	-	Austin Co.	Startup spring'87
Dairymen's Co-op	Tulare, CA	Cheese	4 acres	12	180	-	Construction 4/86
Dairymen, Inc.	Wilkeboro, NC	Milk	Renovations	-	-	Hixson	Completed 9/86
Dandy Distributors	Danbury, CT	Dist. ctr.	7 acres	6.5	55	-	Planning 12/85
Dawn Enterprises	Walhalla, ND	Ethanol (barley)	7 acres	32.6	-	Ultrasystems	Reported 9/86
Daytona Budweiser	DeLand, FL	Beer dist. ctr.	10 acres	1.3	7	-	Planning 12/85
Dean Foods	Huntley, Il	Whse.	Expansion	-	-	-	Construction 10/85
Delice de France	Buffalo Grove, IL	Baked goods	-	2.5	25	-	Planning 7/85
Delicious Foods	Grand Island, NE	Frozen foods	-	8.5	210	-	Planning 1/86
Delmonico Foods	Louisville, KY	Pasta	Expansion	2	-	-	Planning 6/86
Del Monte	Modesto, CA	Distr. ctr.	-	-	-	-	Completed 6/86
Del Monte	Oxnard, CA	Canned foods	Expansion	5	100	-	Completed 11/85
Del Monte FF	Russelville, AR	Frozen foods	Expansion	3	-	-	Construction 6/86
Deltown Chemurgic	Fraser, NY	Ingredients	40M sq. ft.	-	50	-	Startup 12/85
D.E. Stauffer	Chicago, IL	Cookies	-	4	-	-	Planning 9/85
D.H. Foods	Omaha, NE	Muffins	Expansion	1	25	-	Construction 2/86
Di Paolo Baking	Rochester, NY	Baked goods	Expansion	1.2	-	-	Planning 7/86
Doane Products	Ocala, FL	Pet food	7 acres	1.1	35	-	Completed 9/85
Dolly Madison	Emporia, KS	Cakes, donuts	-	1	-	-	Reported 7/85
Domaini Clos Pegas	Napa, CA	Wine	Expansion	-	-	-	Planning 11/85
Dona Ana	Hatch, NM	Flour milling	5 acres	4	25	-	Planning 11/85
Doskocil Cos.	Hutchinson, KS	Pepperoni	Expansion	-	-	-	Completed 9/85
DPM of Arkansas	Booneville, AR	Proc. meats	Expansion	1.2	-	-	Planning 12/85
E							
Eagle Snacks	Fayetteville, TN	Snack Foods	Expansion	25	200	MK-Ferguson	Completion 6/87
Eagle Snacks	Robersonville, NC	Snack Foods	Renovations	-	-	MK-Ferguson	Completed 6/86
Eagle Snacks	Visalia, CA	Snack Foods	250M sq. ft.	-	400	MK-Ferguson	Startup late '87
Eden Foods	Saline, MI	Prepared foods	5 acres	7.5	39	-	Construction11/85
Eileen Gilday	Glassport, PA	Taffey	25M sq. ft.	-	25	Siebert Eng.	Startup 3/86
Exmet of KY	Louisville, KY	Micronutrients	-	1.3	40	-	Planning 11/85
F							
F & A Dairy of Cal.	Stanislaus, CA	Dairy products	Expansion	-	-	-	Planning 11/85
Fantasia Confect.	Sedalia, MO	Baked desserts	-	1.8	40	-	Construction 9/85
Farm Fresh	Lincoln, OK	Milk	Expansion	16.5	300	-	Planning 11/85
Fiorucci Foods USA	Chesterfield, VA	Proc. meats	190 acres	9.5	225	-	Planning 12/85
Flavor House Prod.	Dothan, AL	Roasted nuts	150M sq. ft.	-	200	Siebert Eng.	Startup 9/86
Flowers Baking	Bradenton, Fl	Baked goods	20 acres	6	115	-	Planning 11/85
Flowers Baking	Fairfield, TX	Baked goods	-	-	-	Daniel Int'l	Reported 10/86
Food Services Co.	St. Peter's, MO	Prepard foods, pkg. dist.	-	5	125	-	Construction11/85
Foremost Foods	West Haven, CT	Meat, poultry	-	-	10	-	Planning 9/85
Forest & Farm	Portland, OR	Mushrooms	Expansion	0.4	14	-	Planning 12/85
Four Paws Prod.	Hauppage, NY	Pet foods	Expansion	2.4	64	-	Planning 11/85

(Continued on page 74)

1986

PLANT CONSTRUCTION SURVEY

Company	Plant Location	Primary Product	Square Feet/cap.	Est. Cost ($-million)	Employ-ees	Architects Engineers	Status & Date
Franz Bakery	Portland, OR	Baked goods	Expansion	2.8	26	-	Planning 3/86
Freeze Point	Kankakee, IL	FF dist. ctr.	-	5.5	45	-	Planning 6/86
Friendship Dairies	Belmont, NY	Milk products	Expansion	3.3	-	-	Planning 2/86
Fresh Start Bak.	San Joaquin, CA	Buns	Expansion	-	-	-	Planning 11/85
Frito-Lay	Bakersfield, CA	Snack foods	160M sq. ft.	-	300	Daniel Int'l	Start-up mid '86
Frito-Lay	Dallas, TX	Snack foods	Renovation	-	-	MK-Ferguson	Completed 4/86
Frito-Lay	Frankfort, IN	Snack foods	Expansion	-	200	-	Planning 5/86
Frito-Lay	Perry, GA	Snack foods	120M sq. ft.	-	300	Daniel Int'l	Construction 6/86
Frito-Lay	Pulaski, TN	Snack foods	Expansion	-	-	Hixson	Completed 1/86
G							
Garner-Hart	Sanford, NY	Meat Packing	-	12.3	350	-	Planning 9/85
General Foods/ Birdseye	Fulton, NY	Frozen fruits, veg.	Expansion	3	100	-	Completed 7/86
Gerber	Ft. Smith, AR	Canned baby fd.	Expansion	11.9	-	-	Construction 6/86
George's Co.	Butterfield, MO	Poultry proc.	244 acres	10	400	-	Planning 9/86
Georgia Spice	Atlanta, GA	Spices	2 acres	-	-	-	Planning 11/85
G. Heileman	Milwaukee, WI	Draft beer	-	6	34	-	Completed 6/86
G. Heileman Baking	Milwaukee, WI	Bread	Renovations	2.5	50-100	-	Planning 10/85

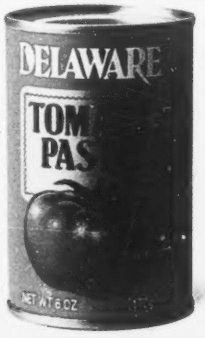
1986 PLANT CONSTRUCTION SURVEY

Company	Plant Location	Primary Product	Square Feet/cap.	Est. Cost ($-million)	Employ-ees	Architects Engineers	Status & Date
Gilster-Mary Lee	Steelville, IL	Sugar	Expansion	1.5	10	-	Completed 11/8
Gilster-Mary Lee	Perryville, MO	Cake mix, cereal	Expansion	2	-	-	Completed 9/86
Gold Bond Ice Cr.	Ocala, FL	Ice cream nov.	Expansion	4.5	40	-	Construction11/85
Gold Bond Ice Cr.	Sikeston, MO	Ice cream nov.	Expansion	-	70	-	Planning 10/85
Golden Cheese Cal.	Corona, CA	Cheese butter,proteins	166M sq. ft.	q10	166	Petit Proj.	Startup 10/85
Golden Flake	Birmingham, AL	Snack foods dist.	Expansion	3	-	-	Construction 8/86
Golden States	City Industry, CA	Fresh salads	166M sq. ft.	5	-	Austin Co.	Startup 6/86
Golden Triangle	Pt. Arthur, TX	Shrimp	1 acre	1.2	75	-	Planning 11/85
Gold Kist	Boaz, AL	Poultry	Expansion	-	200	-	Planning 11/85
Grain Proc. Corp.	Muscatine, IA	Maltodextrins corn syrp.	Expansion	-	-	-	Completed 2/86
GrandMet USA	Fresno, CA	Cheese	-	75	-	-	Reported 10/85
GrandMet USA	Pascagoula, MS	Pet foods	Expansion	1	-	-	Reported 11/85
Great Lakes Cheese	Adams, NYIL	Cheese	Expansion	4	-	-	Construction 7/86
Guernsey-Dell	Chicago, IL	Ice cream flav.	-	-	136	-	Construction 9/85
Guth Dairy	Lake Charles, LA	Milk, dairy products	Expansion	1.1	5	-	Construction 7/86

H

Company	Plant Location	Primary Product	Square Feet/cap.	Est. Cost ($-million)	Employ-ees	Architects Engineers	Status & Date
Haa's Cookies	Plant City, FL	Cookies	30 acres	5	150	-	Planning 11/85

(Continued on page 76)



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PLANT CONSTRUCTION SURVEY

Company	Plant Location	Primary Product	Square Feet/cap.	Est. Cost ($-million)	Employ-ees	Architects Engineers	Status & Date
Haagen Dazs	Tulare, CA	Ice cream	Expansion	-	-	-	Planning 11/85
Hamakua Sugar	Hilo, HA	Meat proc.	-	2	22	-	Construction 5/86
Hardee's	Ardmore, OK	Dist. ctr.	10 acres	4	70	-	Construction11/85
Hass Candy	Hume, MO	Candy	-	-	12	-	Construction 1/86
Helix Int'l	Baton Rouge, LA	Rice products	-	1	10	-	Planning 9/86
Herr Foods	Oxford, PA	Snack foods	Expansion	1.3	30	-	Planning 5/86
Hester Industries	Moorefield, WV	Poultry proc.	Expansion	5.2	215	-	Planning 11/85
Heublein	San Mateo, CA	Bev. whse.	Expansion	-	-	-	Planning 11/85
Hill's Bros.	New Orleans, LA	Coffee	Expansion	10	120	-	Planning 9/85
Hill's Pet Prod.	Bowling Green, KY	Pet food	200M sq. ft.	17	135	Sverdrup	Startup 12/86
Hill's Pet Prod.	Topeka, KS	Pet foods	Expansion	1.2	40	-	Completed 7/86
Hilmar Cheese	Merced, CA	Cheese	Expansion	-	-	-	Planning 11/85
Holland & Nowotny	Van Buren, AR	Poultry proc.	Expansion	-	75	-	Planning 7/85
Howard B. Stark	Pewaukee, WI	Candy	Expansion	1	-	-	Planning 1/86
Huron Dress. Beef	Huron, SD	Beef	Expansion	1.5	40	-	Planning 12/85
H. W. Powers	Brockton, MA	Candy	-	2.7	39	-	Construction 4/86
Hygrade Foods	Jacksonville, FL	Meat proc.	-	2	50	-	Completed 4/86

I

Company	Plant Location	Primary Product	Square Feet/cap.	Est. Cost ($-million)	Employ-ees	Architects Engineers	Status & Date
IBP, Inc.	Council Bluffs, IA	Hog slaughter	-	-	-	-	Startup 7/86
IBP, Inc.	Dakota City, NE	Meat packing	Expansion	2.5	-	-	Planning 9/85
Icicle Seafoods	Seattle, WA	Surimi analogs	-	2	-	-	Startup 5/86
Ingred. Tech. Corp.	Botkins, OH	Fruit systems	-	-	-	-	Startup 10/85
Imperial Paking	St. Louis, MO	Cookies	Expansion	1	50	-	Planning 9/85
Int'l Cheese	Hinesburg, VT	Cheese	Expansion	1.5	-	-	Completed 11/85
Interstate Brands	Columbus, IN	Baked goods	Expansion	3	-	-	Planning 9/85
Interstate Brands	Emporia, KS	Cakes	Expansion	3	-	-	Planning 9/85
Italgrani USA	St. Louis, MO	Seminola	-	10	-	-	Construction 9/85

J

Company	Plant Location	Primary Product	Square Feet/cap.	Est. Cost ($-million)	Employ-ees	Architects Engineers	Status & Date
Jennie-O Foods	Melrose, MN	Turkey proc.	-	-	-	-	Completed 7/85
Jimmy Dean	Osceola, IA	Pork sausage	Expansion	9	-	-	Planning 8/85
J & J Snack Foods	Chicago Heights, IL	Soft pretzels	-	2	-	-	Planning 10/85
J. Pate Indus.	S. Beloit, IL	Cookies	-	-	35	-	Construction11/85
Just Desserts	San Francisco, CA	Baked desserts	Expansion	-	-		Planning 11/85

K

Company	Plant Location	Primary Product	Square Feet/cap.	Est. Cost ($-million)	Employ-ees	Architects Engineers	Status & Date
Keebler	Bluffton, IN	Snack foods	Expansion	14	150	-	Construction11/85
Kellogg	Battle Creek, MI	Cereals	Renovations	500	-	Daniel Int'l	Construction 5/86
Kenlake Foods	Murray, KY	Powdered bvgs. desserts	Expansion	1.5	-	-	Planning 8/86
Keystone Pretzels	Lancaster, PA	Pretzels	9 acres	1.3	-	-	Construction 4/86
Kilpatrick's Bak.	Alameda, CA	Baked goods	Expansion	-	-	-	Planning 11/85
Kraft	Mattoon, IL	Bagels	70.5M sq. ft.	-	-	St. Onge, Ruff	Startup 5/86
Kraft	Stockton, IL	Swiss cheese	Expansion	4.7	-	-	Construction 9/85
Kretschmar Bds.	Concordia, MO	Prepared foods	Expansion	1	100	-	Construction 1/86

(Continued on page 80)

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PLANT CONSTRUCTION SURVEY

Company	Plant Location	Primary Product	Square Feet/cap.	Est. Cost ($-million)	Employees	Architects Engineers	Status & Date
L							
Lamb Weston	Hermiston, OR	Frozen foods	Expansion	4.9	-	-	Planning 8/86
Lewis Bros.	Vincennes, IN	Baked goods	-	5	150	-	Planning 11/85
Loda Egg Farm	Loda, IL	Eggs	9 acres	3.5	50	-	Planning 12/85
Louis Rich	Exeter, CA	Turkey proc.	Ren.250Msqft.	15	-	Sverdrup	Completion '87
Loverseas	Goochland City, VA	Liqueur	-	-	50	-	Planning 11/85
Lundy Packing	Clinton, NC	Meat packing	Expansion	-	800	-	Planning 11/85
M							
Madeline Choc.	Rockaway Beach, NY	Chocolate candy	Expansion	1.5	-	-	Planning 7/86
Marma Maid	Newport News, VA	Dairy prod.	Expansion	1.7	10	-	Planning 9/85
Marshall Labs	Marshall, MN	Spray-dried	7M sq. ft.	0.5	10	-	Startup 1/86
Masa Food Prod.	Louisville, KY	Mexican chips	-	2.5	60	-	Planning 3/86
McCormick	Hunt Valley, MD	R&D flavors, spices	5 acres	-	-	-	Construction10/85
Meadowland Crmy.	Conroe, TX	Milk, orange juice	111M sq. ft.	-	-	Hixson	Completion '88
Michael Vineyards	Sonoma, CA	Wine	Expansion	-	-	-	Planning 11/85
Michigan Dairy	Livonia, MI	Milk	Expansion	-	-	Hixson	Completed 1/86

(Continued on page 83)

Can Opening Made Easy, Quick, Efficient

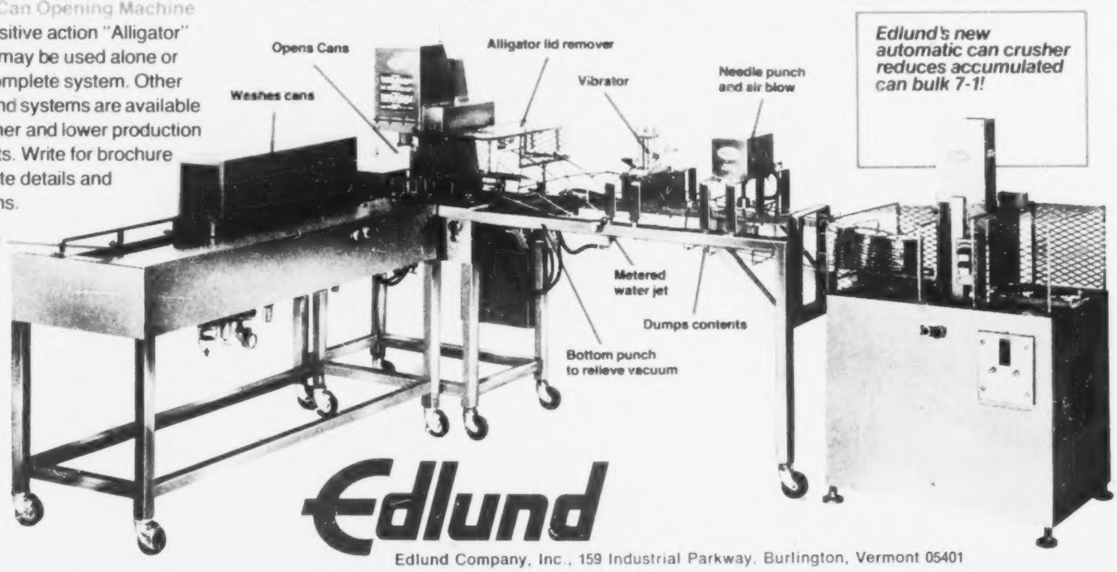
Alligator lid remover

New! Positive action "Alligator" lid remover

This newly designed positive action lid remover automatically grips the lids of cans as they are opened, swings them away and releases them into a waste receptacle. Vise-like clamping action of lid remover jaws assures reliable lid removal every time.

Model 825 Can Opening System washes cans, opens cans, delids cans and dumps product automatically at a rate of 25 cans per minute with **one operator.** Various dumping assists may be selected to assure product removal: vibration, metered water jets, needle punch with air blow. Available with adjust able rails and can size conversion kits for quick set-up change from one can size to another.

Model 825 Can Opening Machine with new positive action "Alligator" lid remover may be used alone or as part of complete system. Other machines and systems are available for both higher and lower production requirements. Write for brochure with complete details and specifications.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Edlund

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Insert 50 or see FEM, p. 133

1986

PLANT CONSTRUCTION SURVEY

Company	Plant Location	Primary Product	Square Feet/cap.	Est. Cost ($-million)	Employ-ees	Architects Engineers	Status & Date
Mid-Con Bottlers	Saylor, IA	Soft drinks	Expansion	5	25	-	Construction11/85
Middlesboro Coca Cola	Middlesboro, KY	Soft drinks	Expansion	1	-	-	Reported 9/85
Midstate Mills	Newton, NC	Wheat flour	Expansion	5	20	-	Construction 9/85
Milupa Co.	East Troy, NY	Baby food	Expansion	5	20	-	Constructoin 9/85
Milwaukee Saus.	Hales Corners, WI	Sausage	-	1	-	-	Planning 4/86
Minn. Dairy Tech.	Little Falls, MN	Cheese	-	95	200	-	Construction 8/85
Mogen David	Westfield, NY	Wine	Expansion	3.9	-	-	Planning 7/86
Montinore Vineyard	Forest Grove, OR	Wine	Expansion	7	20	-	Planning 3/86
Montfort of CO	Greeley, CO	Meat packing	Expansion	4.5	800	-	Construction 7/86
Morrilton Pkg.	Morrilton, AR	Meat proc.	Expansion	3.2	-	-	Construction 6/86
Mrs. Smith's	San Jose, CA	Frozen foods	Expansion	-	-	-	Planning 11/85
Murakami Farms	Ontario, OR	Proc. onions	Expansion	2	50	-	Construction 9/85
N							
Naarden Int'l	Mount Olive, NJ	Flavors, frag.	66M sq. ft.	-	75	-	Construction10/85
Nalley's	Tacoma, WA	Snack foods	Expansion	-	-	-	Startup 9/86
Nat'l Starch	N. Kansas City, MO	Mod. starches	51M sq. ft.	30	-	PSI	Startup 11/85

(Continued on page 84)

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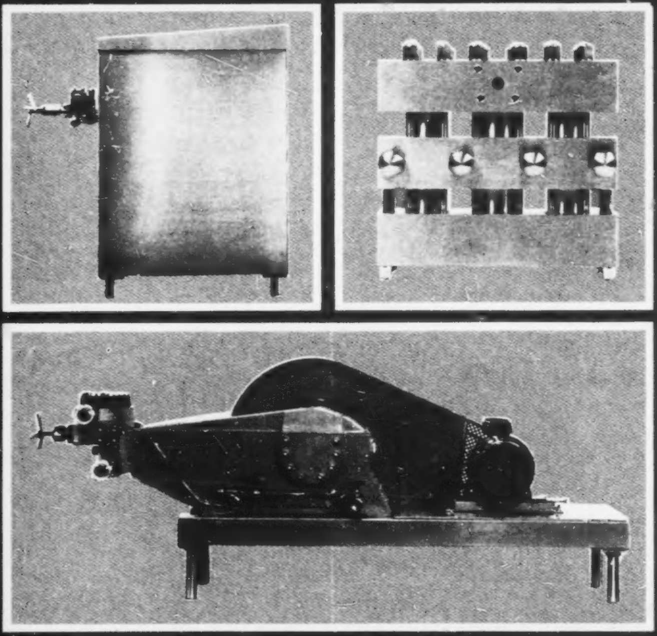

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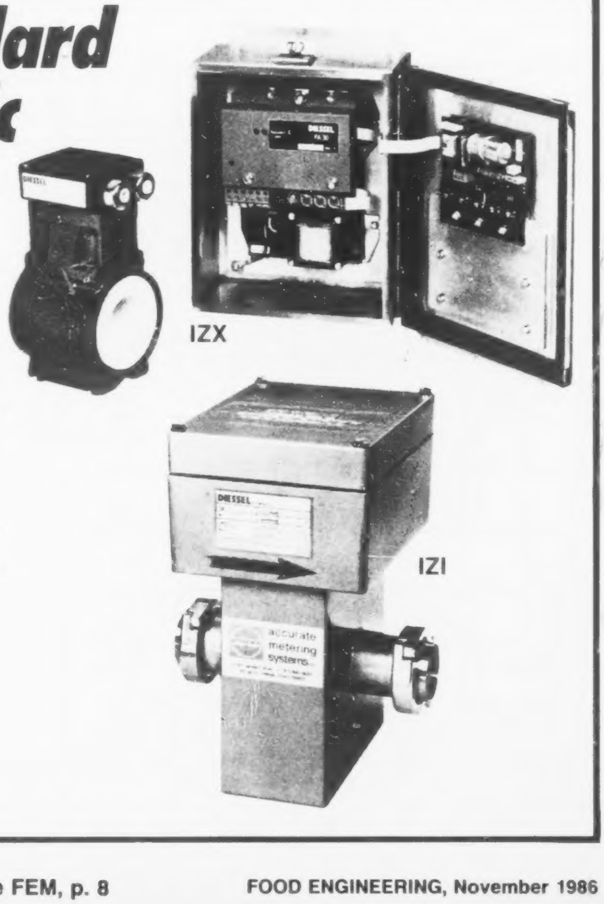
1986 PLANT CONSTRUCTION SURVEY

Company	Plant Location	Primary Product	Square Feet/cap.	Est. Cost ($-million)	Employ-ees	Architects Engineers	Status & Date
N. C. Processing	Mount Olive, NC	Turkey proc.	600 acres	18	800	-	Planning 11/85
Neptune Fisheries	Newport News, VA	Shrimp	-	2.1	125	-	Planning 11/85
N.H. Co.	Yuma City, AZ	Lettuce	-	3.1	30	-	Planning 1/86
Norristown Beef	Hatboro, PA	Beef whse.	-	-	-	-	Construction12/85
North Country Fds.	Rice Lake, WI	Pizza	-	1.1	57	-	Planning 9/85
Nutricheese Co.	Oak Park, IL	Analog cheese	16M sq. ft.	5	-	Austin Co.	Startup 6/86

O

Company	Plant Location	Primary Product	Square Feet/cap.	Est. Cost ($-million)	Employ-ees	Architects Engineers	Status & Date
Ocean Spray	Babcock, WI	Cranberries	Expansion	-	-	Hixson	Completed 9/86
O.K. Industries	Heavener, OK	Chicken proc.	40 acres	5.5	300	-	Planning 4/86
Oldham's Sausage	Holton, KS	Sausage	Expansion	2	50	-	Planning 12/85
Olympic Foods	Spokane, WA	Soft drinks	15 acres	3	-	-	Construction12/85
Oscar Mayer	Columbia, MO	Sausage	Exp. (70Msqft)	8	-	LGMEng/ Const.	Startup 1/86
Oscar Mayer	Kirksville, MO	Ham proc.	Ren.124Msqft	7	100	SverdrupDan	Startup 10/86
Owens Sausage	Richardson, TX	Sausage	-	4	20	-	Construction 7/86

(Continued on page 87)



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Company	Plant Location	Primary Product	Square Feet/cap.	Est. Cost ($-million)	Employ-ees	Architects Engineers	Status & Date
P							
Palermo Baking	Portsmouth, OH	Baked goods	-	2	30	-	Completed 9/85
Paris Bakery	Webster, TX	Baked goods	-	3	-	-	Completed 7/86
Party Pac Popcorn	Greensboro, NC	Popcorn	-	0/3	40	-	Completed 11/85
Pepperidge Farms	Lakeland, FL	Cookies, crackers	24 acres	-	275	-	Planning 4/86
Pepsi-Cola Btlg.	Buena park, CA	Soft drinks	Renovations	-	-	MK-Ferguson	Completion mid-87
Pepsi-Cola Btlg.	Howell, MI	Soft drinks	Renovations	-	-	MK-Ferguson	Completed 8/86
Pepsi Cola	Madison, WI	Pepsi-Cola	Expansion	1.2	-	-	Construction12/85
Perdue Farms	Acomac, VA	Poultry proc.	Expansion	10	1650	-	Planning 7/85
Perdue Farms	Washington, IN	Prepared fds.	Expansion	1.5	150	-	Planning 11/85
Peter's Best Beef	Farmingdale, NY	Proc. meats	Expansion	2.8	45	-	Completed 11/85
Petri Baking	Silver Creek, NY	Baked goods	Expansion	2	39	-	Planning 11/85
Pilgrim Indus.	Mt. Pleasant, TX	Chicken proc.	-	-	350	-	Construction 7/85
Pontiac Foods	Pontiac, SC	Coffee, tea, spices	200M sq. ft.	-	-	Lockwood	Reported 9/86
Power Packaging	Manteno, IL	Frozen foods	-	3.5	150	-	Planning 6/86
Publix	Lakeland, FL	Baked goods	Exp. 110Msqft.	-	-	FoodPlantEng	Construction10/86
Publix	Lakeland, FL	Deli salads, mts.	Exp.(60Msqft)	-	-	FoodPlantEng	Construction10/86
Purity Dairies	Nashville, TN	Ice Cream	-	4	50	-	Planning 9/85

(Continued on page 88)

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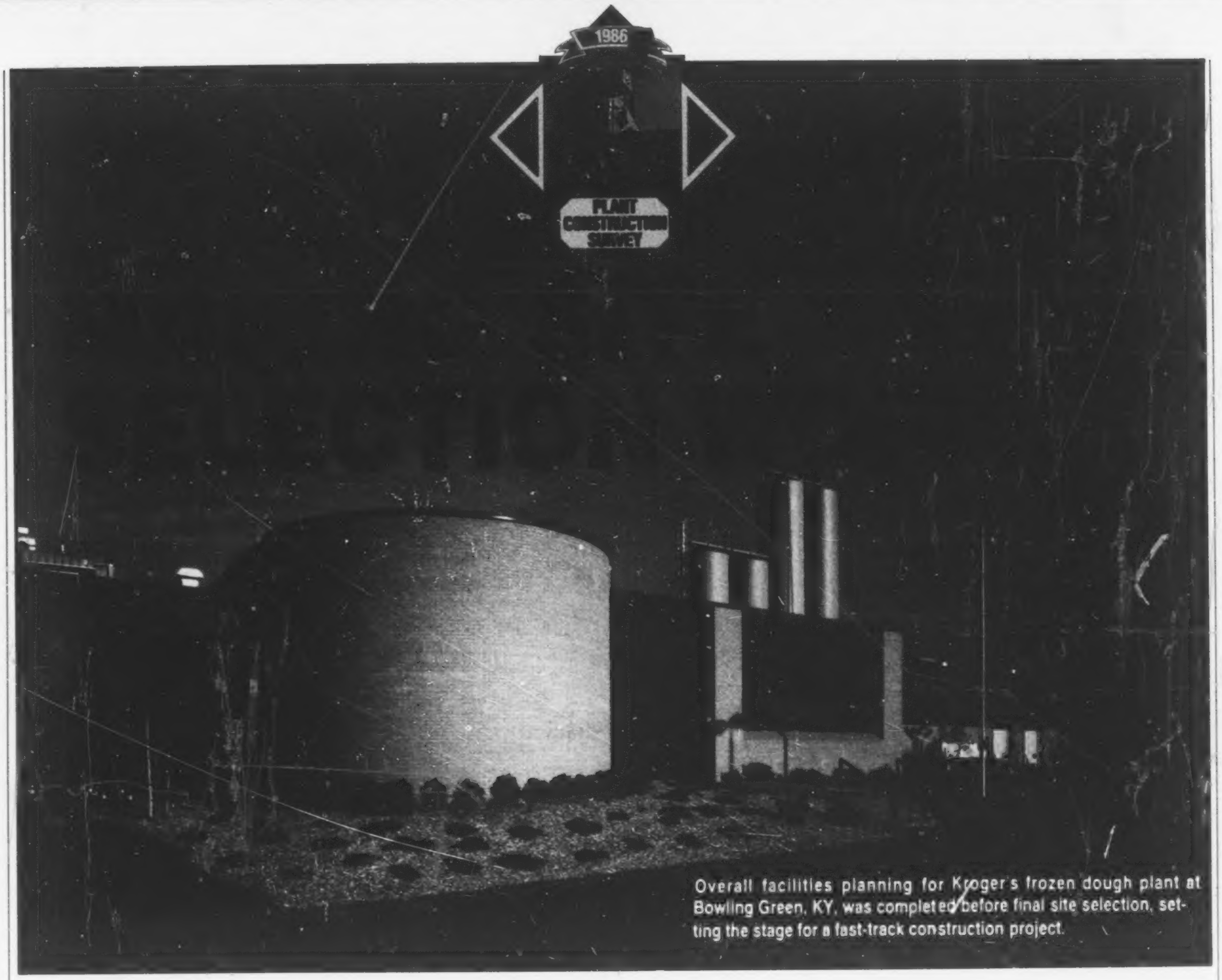
Insert 57 or see FEM, p. 346

Company	Plant Location	Primary Product	Square Feet/cap.	Est. Cost ($-million)	Employ-ees	Architects Engineers	Status & Date
Quaker Oats	St. Joseph, MO	Grain products	Expansion	18	-	-	Planning 5/86
Quali-Tech	Chaska, MN	Flavors, ingred.	45M sq. ft.	-	-	-	Completed late'85
Quality Food Oils	Fairfield, CT	Veg. oils	-	3.5	14	-	Planning 9/85
R							
Rainbo Baking	Sacramento, CA	Bread	Expansion	-	-	-	Planning 11/85
Ramsey Labs	Ft. Worth, TX	Fruit proc.	Expansion	2.2	16	-	Construction 4/86
Randolph Packing	Streamwood, IL	Meat packing	-	2	15	-	Planning 8/86
Reiter Dairy	Springfield, OH	Ice cream	Exp. (15M sqft)	-	-	Hixson	Completed late 86
RHM Co.	Joliet, IL	Snack foods	21M sq. ft.	8	-	Austin Co.	Startup 9/86
Rhomberg Brewing	Dubuque, IA	Beer	Renovations	-	-	-	Completed '85
Richardson Candy	Philadelphia, PA	Mints	30M sq. ft.	-	120	Siebert Eng.	Startup 4/86
Ridgeview Foods	Whitehall, WI	Soft cheese, proteins	Expansion	-	-	-	Reported 5/86
Robert Mondavi	Napa, CA	Wine	Expansion	-	-	-	Planning 11/85
Rocco Processing	Timberville, VA	Lamb proc.	Expansion	-	127	-	Planning 11/85
Roman Meal	Fargo, ND	Baked goods	Expansion	1	-	-	Construction 6/86
Ronnenberg Bwy.	Youngstown, OH	Beer	-	32.8	200	-	Construction 8/85
Rose Acre Farms	Winimac, IN	Poultry, eggs	643 acres	9.5	75	-	Construction10/85
Round Hill Winery	Napa, CA	Wine	Expansion	-	-	-	Planning 11/85
Royal Cup	Birmingham, AL	Coffee, tea	Expansion	2	275	-	Construction 7/85
Rudy's Farms	Florence, AL	Sausage	Expansion	3	80	-	Construction 9/85
S							
San-J Int'l	Hemrico Cty., VA	Soy sauce	10 acres	6.5	15	-	Planning 12/85
Sara Lee	Henderson, NV	Dist. ctr.	-	-	70	-	Construction 8/85
Sathers Co.	Chattanooga, TN	Candy, snacks	Expansion	6	50	-	Construction11/85
S. B. Thomas	Schaumburg, IL	Prepared fds.	Expansion	-	-	-	Planning 12/85
Schreiber Foods	Clinton, MO	Prepared fds.	Expansion	5	75	-	Construction 1/86
Schwartz Meat	Norman, OK	Proc. meats	Expansion	1	18	-	Reported 8/85
Scope Industries	Baltimore, MD	Pet food	-	1	-	-	Construction 6/86
Seaboard Farms	Elberton, GA	Poultry proc.	-	-	200	-	Construction 1/86
Silver Lk. Cookie	Islip, NY	Cookies	Expansion	-	150	-	Planning 11/85
Sky Bros.	Altoona, PA	Food service	Exp. (40Msq.ft)	2.5	-	St. Onge, Ruff	Startup 8/86
Snow King	Pottstown, PA	Frozen meats	Expansion	1	-	-	Planning 5/86
SE Spec. Foods	Laurel, MS	Muscadine,berry,juice,	30M sq. ft.	7	400	Sverdrup	Startup 1986
Southern Best	Burgaw, NC	Bacon	-	2.5	75	-	Construction 8/85
Southland Estate	Selma, NC	Wine	23 acres	2.1	8	-	Construction11/85
Southwest Canners	Amarillo, TX	Coca-Cola	-	10	60	-	Planning 1/86
Springwater Cookie	Springboro, OH	Cookies	-	2.5	60	-	Construction11/85
Stayton Cannery	Salem, OR	Repackaging	-	5.4	-	-	Planning 5/86
Steuben Foods	Elma, NY	Yogurt	180M sq. ft.	-	-	Hixson	Startup 7/85
Sun Harbor AL	Alabaster, AL	Canned pet food	-	-	-	-	Completed 11/85
T							
Takeda Chem. Prod.	Wilmington, NC	Vitamin B-1	1500 acres	15	100	Davy McKee	Completed 9/85

Company	Plant Location	Primary Product	Square Feet/cap.	Est. Cost ($-million)	Employees	Architects Engineers	Status & Date
Tara Foods	Itasca, IL	Prepared foods	2 acres	1.1	36	-	Planning 9/85
Tastybird Foods	Pine Bluff, AR	Poultry proc.	Expansion	1.5	-	-	Construction 6/86
T.G. Lee Co.	DeLand, FL	Dairy products	Expansion	3.2	12	-	Planning 6/86
T&M Nut Proc.	Merced, CA	Nuts	Expansion	-	-	-	Planning 11/85
Tone Bros.	Des Moines, IA	Spices	Expansion	-	100	-	Construction 11
Tony's Pizza	Salina, KS	Frozen pizza	Expansion	1	12	-	Construction 7/86
Trauth Dairy	Newport, KY	Ice cream, milk	Expansion	-	-	Hixson	Completed 4/86
Townsend Farms	Troutdale, OR	Raspberries	Expansion	1.5	-	-	Planning 9/85
Trenton Foods	Trenton, MO	Prepared fds.	Expansion	-	200	-	Construction 1/86
Tropicana	Bradenton, FL	Frozen orange juice	50M sq. ft.	-	-	St. Onge, Ruff	Startup 4/87
Twistee-Treat	Ft. Myers, FL	Ice Cream	Expansion	2	65	-	Planning 6/86
Tyson Foods	Rogers, AR	Poultry dist.	Expansion	12.2	35	-	Planning 12/85
Tyson Foods	Morrison Bluff, AR	Poultry proc.	-	-	-	-	Reported 8/86
			U				
Uncle Ben's	Greenville, MS	Rice milling	Expansion	16.6	50	-	Construction 8/86
Universal Seafood	Dutch Harbor, AK	Surimi	-	10	130	-	Planning 9/85
			V				
Valley Beverage	Merced, CA	Bvg. dist. ctr.	-	-	-	-	Planning 11/85
Valley Whsle, Mts.	Alamo, TX	Sausage	-	1.1	100	-	Construction 7/86
Vendervoot Dairy	Ft. Worth, TX	Milk	Renovations	-	-	Hixson	Completed 11/86
Van Dyn Choc.	Clark Cty., WA	Chocolate	-	4.7	-	-	Planning 8/85
Van Dyn Choc.	Eugene, OR	Confections	-	4.4	75	-	Planning 11/85
Vernor's Inc.	Detroit, MI	Soft drinks	3 acres	1.5	-	-	Planning 8/85
			W				
Walton Foods	Bridgeton, NJ	Prepared foods	3 acres	2	30	-	Planning 4/86
Wenner Bread	Bohemia, NY	Baked goods	-	1.6	66	-	Planning 4/86
Western Sugar	Greeley, CO	Refined sugar	-	4.5	45	-	Completed 7/86
Western Sugar	Scottsbluff, NE	Sugar by-products	1,707 acres	9.8	200	-	Completed 12/85
Wilson Foods	Cherokee, IA	Prepared foods	Expansion	-	65	-	Planning 9/85
Wilson Foods	Marshall, MO	Meat packing	Expansion	5	80	-	Planning 10/85
Wilson Foods	Monmouth, IL	Hams	Expansion	2.8	100	-	Planning 12/85
Winky Food Prod.	Chicago, IL	Desserts	-	-	40	-	Completed 9/85
Wise Foods	Berwick, PA	Whse.	Expansion	3.5	-	-	Planning 10/85
Wornick Co.	New Braunfels, TX	Prepared foods	-	5.5	200	-	Planning 4/86
Wortz Biscuit	Poteau, OK	Baked goods	-	7	100	-	Construction 1/86
			Y				
Y&S Candies	Lancaster, PA	Candy	Expansion	-	35	-	Planning 4/86
			Z				
Zachary Co.	Frankfort, IN	Candy	-	0.5	120	-	Construction11/85
Zartic Co.	Rome, GA	Poultry proc.	-	-	100	-	Construction 6/86
Zemco Ind Russer Fd	Buffalo, NY	Proc. meats	Expansion	3	20	-	Planning 11/85



Overall facilities planning for Kroger's frozen dough plant at Bowling Green, KY, was completed before final site selection, setting the stage for a fast-track construction project.

Build a new plant? Renovate or expand an existing facility? Rehab an abandoned building? Here's how several food companies arrived at different site decisions – and why.

Dozens – sometimes hundreds – of criteria may be considered in a site selection study. Key factors typically include access to raw materials and markets, transportation costs, labor costs and availability, utility costs and availability, site development needs, taxes and financial incentives, political and regulatory problems, community attitudes and quality of life.

But in the end, "there's no such thing as a universally good location," observes James M. Bruce, Jr., director of management and economic consulting at Lockwood Greene Engineers, a major architectural/engineering firm offering site selection services. "Every site selection represents a trade-off between assets and shortcomings. The idea is to achieve an optimal match between a company's particular needs and the...conditions found in various alternative locations."

What follows are some examples of how several food companies applied varying criteria to arrive at optimum site decisions.

CHARLES E. MORRIS
Midwest Editor

Kroger: Fast-track project

Kroger Company's $20-million, 145,000 sq.-ft. frozen dough plant, started up in September 1981 at Bowling Green, KY, supplies oven-ready products to in-store bakeries operated by the chain's supermarkets throughout the North Central and Southern states. Transportation and distribution were therefore critical elements in site selection for a new plant, first of its kind for Kroger. From groundbreaking to startup, the plant was built in just 18 months on a fast project track following a feasibility study and "centroid analysis" conducted by a team made up of Kroger and Lockwood Greene engineers.

The feasibility study defined the scope of the project and included marketing forecasts; plant size and equipment projections; land, utility and waste treatment requirements; estimated costs and time to build – "all the imperatives which must be analyzed before you spend money," said Len Bednarski, who headed the Lockwood Greene study group.

Next step was the centroid analysis – a distribution study considering all the products, routes, distances and other transportation variables – to establish a "center of gravity" or mathematical distribution center. "Kroger was leaning toward a Kentucky loca-

(Continued on page 94)

tion to begin with," said Bednarski, and the centroid study confirmed a Kentucky site as most efficient. Available sites at and around the center were then evaluated and several optimum sites identified. The feasibility study and site search together formed the basis for funding authorization and the "go-ahead" for final site selection and pre-engineering for a fast-track project (i.e., a tightly scheduled project where construction gets underway as drawings are produced and materials are delivered to the site).

By early 1980, as final design work was underway, geotechnical analysis revealed that soil conditions at the first-choice site, London, KY, were such that building there would create additional economic burdens for Kroger. Fortunately, an alternative site was identified and the project was quickly shifted from London to Bowling Green. Result: One month after the originally-scheduled startup date, the plant was in full operation and making a profit.

Steuben Foods rehab

Steuben Foods, a relatively new company formed in 1982 from the former Prattsburg division of Elmhurst Milk & Cream Co. in Jamaica, NY, needed expanded facilities to produce *Whitney's* yogurt for Whitney Foods, a subsidiary of Kellogg. A site selection study conducted by Steuben engineers and Hixson Engineers/Architects compared several options: 1.) Expanding the company's existing plant at Prattsburg, NY; 2.) Building a new plant from the ground up at available sites elsewhere in New York; 3.) Renovating an existing building at another location.

The first two alternatives were ruled out on the basis of established needs and cost effectiveness. Solution: A 786,000 sq.-ft. building abandoned 10 years ago by Western Electric at Elma, NY (about 15 miles outside of Buffalo) "which could be converted into a high-tech facility," said Stephen Schlegel, marketing manager at Hixson.

Hixson and Steuben engineers converted 172,000 square feet of the building into the new yogurt plant, which started up in July of last year, and Steuben is developing the rest of the site into "The Agri-business Center of Western New York." Steuben

(Continued on page 97)

Comparative Annual Operating Cost Simulation

A location study comparing geographically variable annual operating costs for a canned foods plant shipping 14.8 million lbs. per year and employing 300 people, conducted by The Boyd Co., shows Panama City, FL as the low cost location. The complete cost study is available from: The Boyd Co., Location Consultants, 310 N. Harrison, Bldg. B, Princeton, NJ 98540

	Chicago Metro Area	Minneapolis Metro Area	Cleveland Metro Area	New York Metro Area	Philadelphia Metro Area	Los Angeles/ Long Beach Metro Area	Atlanta Metro Area	Houston Metro Area
Nonexempt Labor								
Weighted Average Hourly Earnings	$ 10.09	$ 10.73	$ 11.16	$ 9.45	$ 9.88	$ 9.67	$ 8.95	$ 11.09
Annual Base Payroll Costs ($1,000)	5,763	6,129	6,375	5,398	5,643	5,524	5,112	6,335
Fringe Benefits ($1,000)	2,132	2,268	2,359	1,997	2,088	2,044	1,891	2,344
Total Labor Costs ($1,000)	$ 7,895	$ 8,397	$ 8,734	$ 7,395	$ 7,731	$ 7,568	$ 7,003	$ 8,679
Electric Power Costs ($1,000)	$ 242	$ 138	$ 205	$ 339	$ 231	$ 218	$ 192	$ 174
Occupancy Costs ($1,000)								
Amortization	$ 636	$ 634	$ 659	$ 702	$ 644	$ 694	$ 574	$ 618
Ad Valorem Taxes	184	137	103	195	120	60	75	73
Heating and Air Conditioning	122	86	98	132	91	27	52	27
Total Occupancy Costs ($1,000)	$ 942	$ 857	$ 860	$ 1,029	$ 855	$ 781	$ 701	$ 718
Total Power and Occupancy Costs ($1,000)	$ 1,184	$ 995	$ 1,065	$ 1,368	$ 1,086	$ 999	$ 893	$ 892
Transportation Costs ($1,000)	$ 465	$ 683	$ 449	$ 563	$ 499	$ 1,385	$ 253	$ 524
Total Annual Geographically-Variable Operating Costs ($1,000)	$ 9,544	$10,075	$10,248	$ 9,326	$ 9,316	$ 9,952	$ 8,149	$10,095

Source: The Boyd Company

envisions its yogurt plant as the anchor which can attract other food companies and suppliers into a vertically integrated food processing complex where tenants can share space and utility costs. "Our objective is not just to lease space but to provide synergy," says Ray Birdsall, manager of business development at Steuben Foods.

Major reasons why Steuben selected the Elma site, Birdsall added: 1.) Market access. Whitney's yogurt is a national brand, manufactured and distributed from one location, and 48 percent of the U.S. population (plus 62 percent of the Canadian population) is within a 500-mile radius of Buffalo. 2.) Good transportation. The Elma site is on county highways which access an interstate highway eight miles away, and – although Steuben doesn't currently ship by rail – five railroad lines totaling 8,500 feet of track served by ConRail are on site. Buffalo is also a trucking hub, with many common carriers. 3.) Proximity to raw materials. Milk – the plant's basic raw material – is supplied by several hundred New York dairy farmers. 4.) Pre-development, which minimized civil engineering work and kept construction costs down. "Millions of dollars had been invested by the former owner" in site development, said Birdsall. 5.) Assistance from the Erie County Industrial Development Authority, which "served as a clearinghouse for solving problems" and helped obtain a UDAG grant to improve the site and bring in utilities. Example: A seven mile pipeline with two pumping stations linking the site to the municipal wastewater treatment plant. 6.) A compatible labor supply. "People in Buffalo care about their jobs – they're skilled, trained, dedicated and have an excellent work ethic," said Birdsall. 7.) Utilities – available water, natural gas, electricity, wastewater treatment.

Campbell upgrade

Campbell Soup, currently renovating its 80-year-old original plant at Camden, NJ in a three-year $37-million project, was faced with the typical options in deciding what to do with an aging plant, said Plant Manager David E. Winkler at the *Food Plants '86* conference held October 1-3 by Food Plant Strategies at Cherry Hill, NJ. The alternatives: 1.) Do nothing – "appoint a committee to study the problem;" 2.) Tear the plant down and build a new one on the same site; 3.) Move to a new location; 4.) Modernize the existing facilities.

For community reasons, Campbell wanted to stay in Camden but had an obligation to its shareholders to assess the pros and cons, Winkler continued. One major criterion stressed by management: The evaluation should consider long-term implications, not just short-term gains.

The advantages of staying in Camden related mainly to the plant's location and included:

- *The people*, a well-trained work force, many of whom has been with Campbell for 30 to 40 years and more.
- *Logistics:* Within a 400-mile radius of Camden are 60 million consumers (one-fourth of the U.S. population) and 29 percent of U.S. canned food sales. Camden is served by an excellent transportation system; freight costs are only 75 percent those of the company's Paris, TX plant. Average shipping distance to the company's 460 retail customers is 210 miles versus 426 miles from its other canned foods plants; the average supplier (of 20 key items) is 127 miles closer to Camden than to the other canning plants.

Finally, the area has a good water supply and Campbell has good community relations of long standing.

Still, there were disadvantages inherent in the plant itself:

- *High operating costs:* Container production costs were 20 percent higher at Camden than at Paris (which has a similar product mix), and the cost of warehousing finished product was more than twice that of Paris.
- *Excess buildings*: The 12-year-old Paris plant occupies 1.37 million square feet yet turns out more than twice as many cases per square foot as the 2.36-million sq.-ft. Camden complex.
- *Poor communications*: The multistory Camden plant was built in the days when "gravity flow" was the norm.

Campbell's decision: "To radically upgrade the existing facility," said Winkler, through:

- *Consolidation:* "Like an overweight person, the plant will lose excess poundage" by consolidating warehouse and distribution operations in one place and selling an off-site warehouse five miles away. In-house manufacturing of metal cans will be discontinued in favor of purchasing, to free space for other purposes and take advantage of the latest can technology. These moves will cut the current 2.4 million square feet in half and the number of buildings from 31 to 18.
- *Modernization:* New filling and closing equipment, realigned labeling operations, additional sterilizing systems, blending improvements, multiple receiving facilities and a computerized communications and reporting system will "help overcome the disadvantages of the multi-store layout," Winkler concluded.

Pioneer Foods

Another example of a food company which found an existing building suited to its needs is Pioneer Food Service, a division of Savannah Sugar Refining Co. Pioneer needed a Midwestern location offering market access via interstate highways for a raw sugar packaging plant.

Solution: A 25,000 sq.-ft. former toy plant at Jackson, MI, located through Consumer's Power Co., the local gas and electric utility. Wage scales, not among the lowest in South Central Michigan, were of secondary importance because the plant employs only 12 to 15 people. The plant fit Pioneer's size requirements and was equipped with the shipping docks it needed, said Richard R. Surbrook, director of economic development at Consumer's Power.

Assisted by industrial revenue bonds and tax abatement arranged through Consumer's Power, Pioneer installed automated packaging equipment and started up early this year.

Bottom line: With food plants getting fewer, bigger, more highly automated and more expensive, solid site decisions are more critical than ever.

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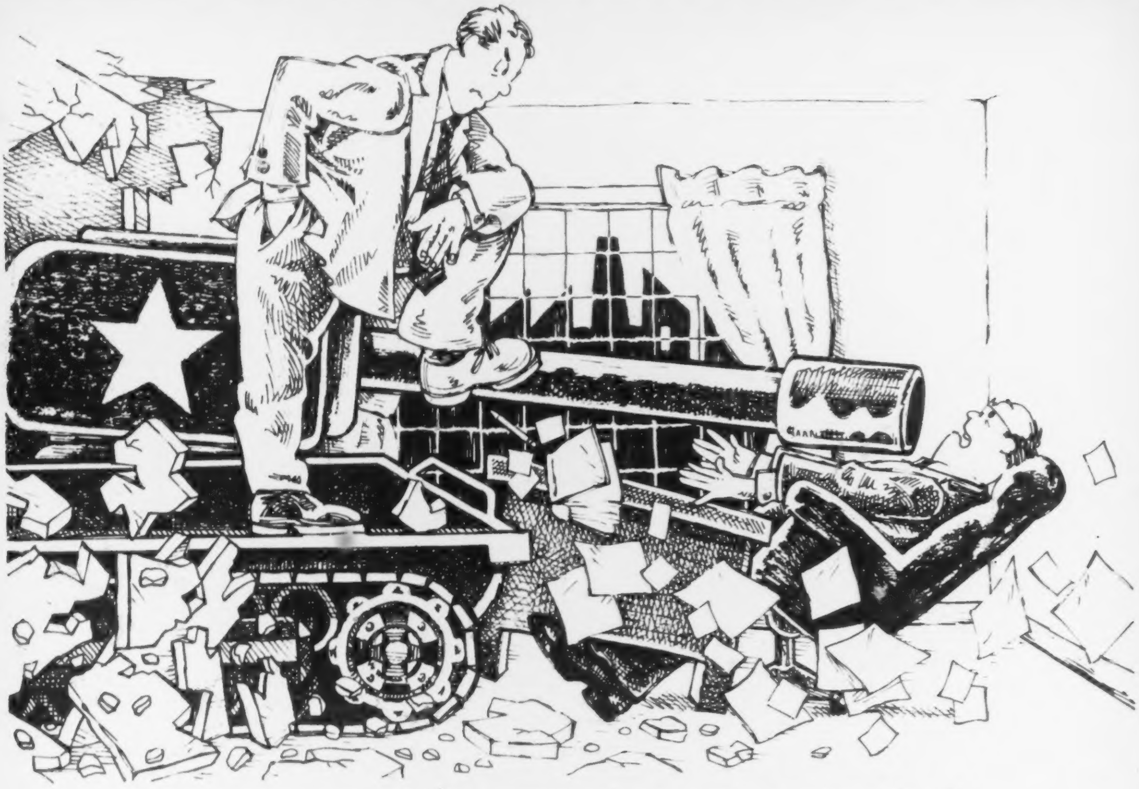

"THEN I ASSUME YOU'RE GOING TO BE PRETTY INFLEXIBLE IN THIS SALARY DISCUSSION, McDERMOTT."

1986 SALARY SURVEY

ALSO: DAIRY INGREDIENTS

FOOD ENGINEERING

COVER STORY

While everyone would like a little more money in their paycheck, the figures from this year's salary survey indicate that food industry personnel are not doing all that badly.

News

13 Industry Report
This month's Report discusses the problems created by an increasing number of product liability suits with increasing award amounts; a study on the benefits of using on-farm ultrafiltered milk in cheese processing; and corporate news from the industry.

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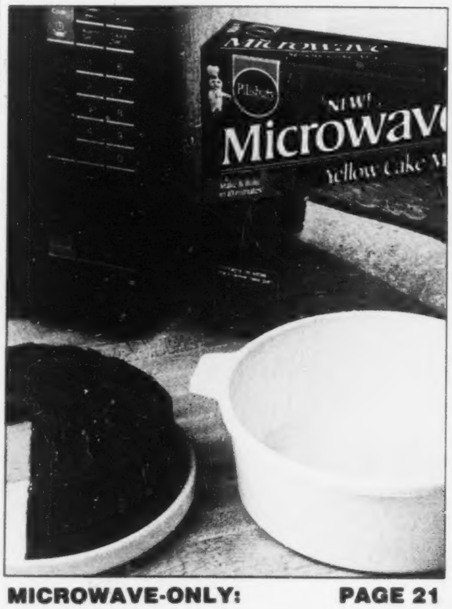

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Features

42 Salary Survey
How does your salary compare to others in your job category? Did you get a raise this year? How did it compare with your peers? For food industry personnel across the board, the answers are found each December in *Food Engineering's* Annual Food Industry Salary Survey.

51 Dairy Ingredients
Both the development of new and more functional milk proteins, and consumers concerns for improved health are responsible for the increased use of these ingredients in foods.

SALARY SURVEY: PAGE 42

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Food Packaging

28 CAP Warning!
Controlled atmosphere packaging is a hot technology, but before plunging in, take the time to understand exactly what's involved. The type of product, film and environment can make a lot of difference.

32 Self-Chilling Can
By implanting a CO_2 device inside a container, a beverage can be cooled to 33°F within 35 seconds of activation.

35 Adhesive Trends
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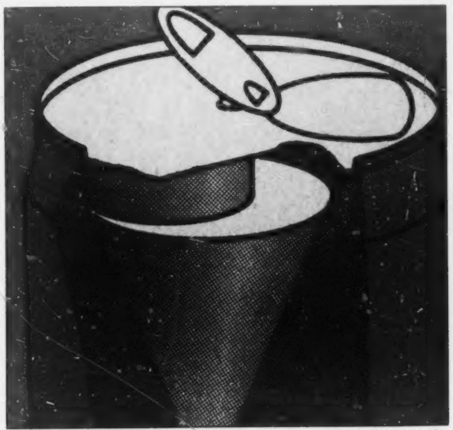

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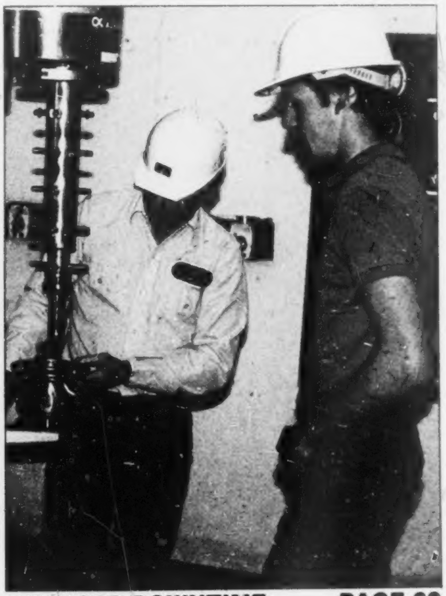

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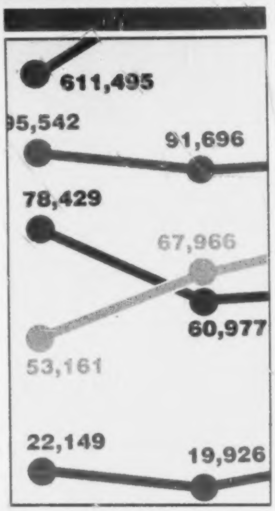

Special Emphasis

EXPANDING USES OF MILK PROTEINS:
Food scientists are producing new dairy ingredients, which are aiding food processors in the engineering of new food products.

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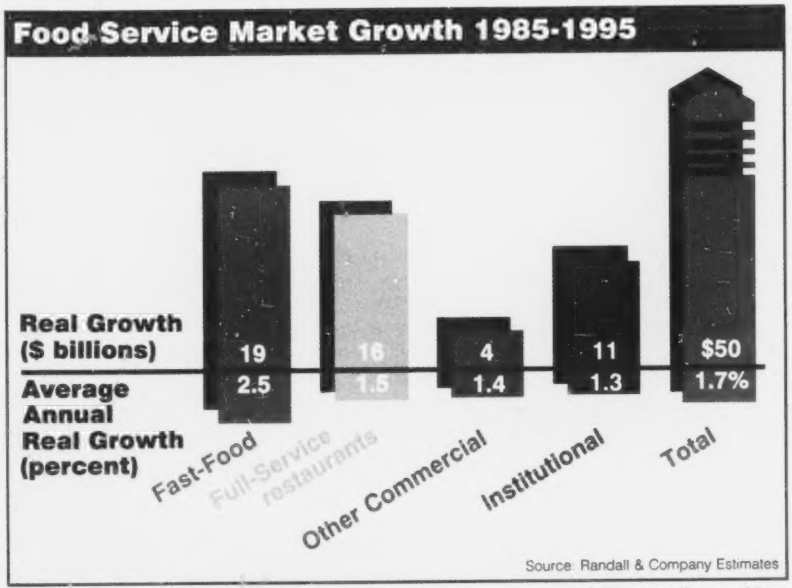
The Food Service Market: an opportunity for real growth



Source: Randall & Company Estimates

The food service industry will grow at an average annual rate of 1.7% over the next ten years, with real growth of $50 billion.

The food service market will increase at an average annual rate of 1.7 percent real growth through 1995, to $325 billion, providing as good a growth opportunity as retail sales. Randall & Co., Los Altos, CA, estimates that both the food service and retail food market segments will grow by $50 billion in the next decade, with food service reaching a 43 percent share of market.

Coming opportunities

Randall & Co. says the coming decade will present opportunities for:

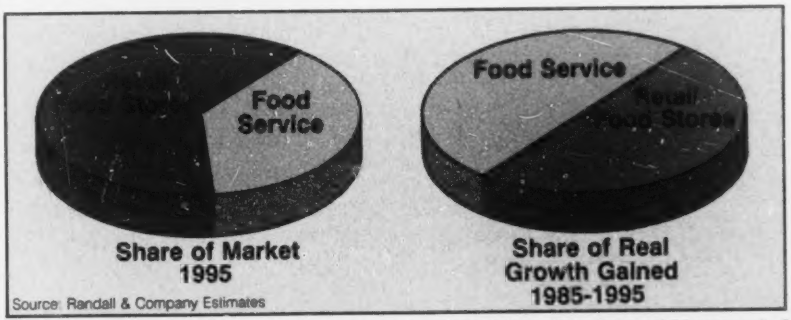
- Office park food courts offering retail and subscription menu plans, possibly subsidized by employers;
- Cuisine naturelle, with many finer restaurants adjusting menus to reflect increasing customer interest in natural and healthy foods;
- Health food restaurants and cafes, offering upscale items such as fresh salads, fresh homemade soups, lean meat specialties, fresh fish and poultry dishes, etc., catering to a growing segment of the population;
- Food emporiums, as in major European cities, where wide assortments of fresh and prepared food products and food services can be purchased;
- Upscale fast-food establishments with upgraded menus, service styles, and ambience, catering to maturing baby boomers;
- Mobile food service using specially equipped vans with full production and service capabilities;
- Scaled down and mini food service units to accommodate micro-segmentation of customer markets.

If your company is not positioning product for food service sales, then it is not only ignoring almost half of the entire food product market, it is ignoring potentially a very lucrative market. Food service products are generally packaged in institutional sizes. This translates to lower per unit packaging costs. Labeling costs are also lower, both because of package size and because the need for eye-catching consumer product label design is circumvented. Larger unit size also translates to lower handling costs. Another major cost that is eliminated is the need for consumer advertising.

Packaging for food service

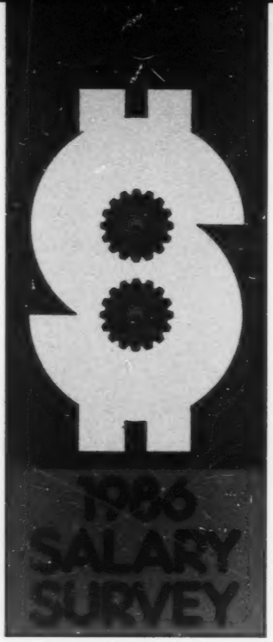
Packaging for the food service does not simply mean No. 10 cans anymore. There are several recent packaging methods that lend themselves to institutional sizes. Shelf-stable institutional retort pouches and steam table trays have been developed by military and space food service programs, laying the groundwork for commercial applications. Controlled atmosphere packaging can also be utilized to keep foods fresh for longer periods of time. Meals can be prepared fresh, then held under a gas mixture designed to hold that fresh-cooked taste and appearance for up to several days. Master packages can be used to keep several individually packaged meals in a controlled environment. Controlled atmosphere packaging *does* require refrigeration. Aseptic packages (which do not require refrigeration) are being developed in sizes large enough for food service use. Bag-in-box designs are ideal for the volumes required for food service. Bags-in-boxes can also eliminate the problems of returning and cleaning spent containers.

The food service market is expected to reach $325 billion by 1995. Providing an increased potential for manufacturers to produce higher value-added products, food service is a market you can't afford to ignore.



Source: Randall & Company Estimates

The food service sector will reach 43 percent of the total food market and 50 percent of the real growth recorded by 1995.



FOOD SALARIES STAY AHEAD IN 1986

While everyone would like a little more money in their paycheck, the figures from this year's salary probe indicate that you're not doing all that badly.

KEVIN J. HANNIGAN, Features Editor

There are two burning questions that just about everyone asks themselves: How does your salary compare to others in your job category? And did you get a raise this year? For food industry personnel from top executives to folks on the line, the answer is found each December in *Food Engineering's* Annual Food Industry Salary Survey.

FE's survey, performed by Chilton Research Services, is designed to provide a cross-section of food industry salaries. The survey is weighted by title, geographic region, size of company, and a number of other variables to reduce the margin of error. Here's how it works.

Each year, 8,000 individuals representing all areas of responsibility in the food industry are asked to reveal their annual wage, whether or not they've received a raise this year, and how large that raise was. The questionnaire also asks for the individual's opinion on a number of questions regarding morale—such as "Do you feel optimistic or pessimistic about your future career?," or "Do you feel the quality of life in the work place is improving or worsening?"

This year, 1,378 respondents told *FE* how they were doing. And, for the most part, they were doing better than in 1985. Where specific questions were asked—about current attitudes, for example—many chose not to answer and others had more than one answer for us. So, in some cases, the total number of answers doesn't add up to 1,378.

Where salaries are concerned, however, the respondents told all, permitting us to draw conclusions about the median salaries for some specific areas and skill levels. For example, you're likely to make more working with candy and spaghetti, where the median salary is $44,000 per year, than with meats and seafood, where the median is $39,000. Your experience in the food industry has a cash value, too, represented by a difference of $15,000 between the median salary for a beginner and somebody with 30 or more years of experience.

While salary surveys often discuss Average, Mean and Median salaries, only the Median is used here because it reflects the facts more accurately—the Median represents a true midpoint.

Here, then, are the numbers for 1986.

A look at the big picture

In late summer, says Chilton Research, the average (seasonally adjusted) U.S. wage was $31,808, unemployment was down, but so was consumer spending. Personal income was rising at a rate of 4% per year, and the cost of living index was up slightly. Meanwhile, industrial production and plant capacity were down and inventories were up. GNP was expected to drop, too, along with after-tax corporate profits. Depending on your viewpoint, the overall picture was either one of stability or stagnation.

Prospects for the food industry, however, were somewhat brighter. About 75% of the responses to *FE's* survey this year indicate that business—and job security—is good and getting better. And the salary figures tend to back up this point of view. The Median salary for the industry this year was $41,000, and all job categories appeared to be doing well. About two-thirds (65.3%) of the food technologists surveyed, for example, reported salaries equal to or above the national average—and 47.2% were earning more than $35,000 per year.

A food technologist in Oregon who makes $34,400 sums up conditions for many other technical people. "This year's salary increase is an important breakthrough for product development at our company," he says. "The last three years have been a slow process of bringing R&D salaries into the range appropriate for our responsibilities."

But not everyone is doing well. "Many companies seem to be giving smaller raises due to economic reasons," says a quality control manager in Kentucky who makes $56,800 after 17 years. "This unfortunately has affected companies that are making record sales and profits."

Still, pay raises were the rule. Of the 1,378 respondents to this year's survey, 1,087 (78.9%) reported salary increases. And the largest number of increases (45.1%) were in the 5-8% range. Only about 15.7% (216 respondents) said that their salaries hadn't changed from 1985. And only 17 respondents reported a decrease.

The exception to the rule was managers earning $45-60,000 per year, who were more likely to get a raise and less likely to take a pay cut. This group includes plant managers, engineering managers, packaging managers, sales managers and technical directors.

While most of you got a raise this year, salary increases were smaller – and fewer – as the salary level rose. An engineering manager in Texas, who makes over $60,000 per year, reports: "This year, our company froze all salaries due to profits not being as budgeted." And a marketing director for a New Jersey beverage plant, citing low increases, says: "I expect a higher turnover among younger middle management employees." His counterpart at a Maryland firm agrees, saying: "It's damned difficult to make significant advances without moving from one company to another."

Extra income varies widely

In addition to a regular paycheck, you also may have received some other forms of earned income this year. Of the 1,378 respondents, for example, 52.1% say that they receive extra compensation such as bonuses, cash awards, incentives, etc. But 43.8% report that they don't receive any extra compensation. Men did better than women in this regard, with 53.8% of the men reporting some form of extra income compared to only 39.2% of the women.

"Our company believes salaries should be on the low side," says a quality control manager in Washington, "but a generous bonus program rewards people with incentive." However, at a multiproduct manufacturer in New York State, says a project engineer, bonuses differ in kind. "Christmas bonus is the same for everybody up to the middle management level," she says, "and it's been $300 for many years. Higher levels get bonuses based on performance."

Based on the survey results, women appear slightly more likely to receive cash awards and bonuses, while men are slightly ahead in terms of profit sharing, stock options and incentives. While very few men

(Continued on page 46)

TABLE METHODOLOGY

A. The tables in this article are designed to be read from left to right. For example, in the large table below that lists salaries vs. job titles, the chart will tell you that of the Presidents surveyed, 6.4% made $45-49,999, 3.2% made $55-59,999, and so forth.

B. In preparing the tables, we have eliminated from consideration sample cells too small to support a valid projection.

C. You will notice that percentages rarely add up to 100%. That is because of either multiple responses to a given question, no answer or "don't know" answers, or answers that were so diverse as to be classified as "other".

SALARY RANGE BY JOB FUNCTION

	Under $25,000	25-29K	30-34K	35-39K	40-44K	45-49K	50-54K	55-59K	60-69K	70K or More
President	10.6%	4.3%	3.2%	4.3%	11.7%	6.4%	3.2%	3.2%	7.4%	45.7%
Vice President	5.0	2.0	7.1	3.0	8.1	3.0	11.1	6.1	17.2	36.3
Technical Director	4.8	4.7	8.2	14.1	10.6	14.1	9.4	8.2	18.8	7.1
Plant Manager	5.9	9.3	11.9	21.2	9.3	16.1	5.9	5.1	11.0	3.3
Project Engineer	2.1	5.7	17.7	27.7	12.8	16.3	12.1	2.1	2.8	0.7
Production Supervisor	9.1	21.8	27.3	23.6	14.5	1.8	—	1.8	—	—
Engr./Pkg. Manager	1.5	5.3	7.5	12.0	19.5	13.5	15.0	7.5	10.5	7.6
Department Manager	3.4	22.4	13.8	20.7	13.8	12.1	5.2	3.4	1.7	3.4
Food Technologist	21.7	13.0	18.1	15.9	18.8	5.1	2.9	2.9	0.7	0.7
Quality Control Manager	12.1	19.4	16.9	12.9	16.9	7.3	5.6	4.0	3.2	1.6
Mktg/Sales Manager	3.9	11.8	13.7	7.8	21.6	13.7	9.8	4.9	6.9	5.0
Purchasing Manager	24.3	13.5	14.9	10.8	16.2	8.1	4.1	—	4.1	4.1
Other	11.4	8.3	19.1	10.2	10.2	11.5	5.7	7.0	6.4	10.1

Source: Food Engineering 1986 Salary Survey

(5.3%) claimed either a company car or a vehicle allowance as extra income, no women claimed any at all. And only one respondent in the $30-60,000 range claimed such an allowance. Of those who get it, 47.2% were in the $60,000-plus range.

The incentives mentioned were most likely performance-related perks such as vacations for meeting sales objectives. And car allowances tend to be related to sales activities. Only 1.0% of the extra income reported was overtime. And that, too, is a sore point. A project engineer for a large California bottler complains that "Floor washers with less responsibility receive higher salaries via overtime." And a packaging manager for a Pennsylvania bottler states: "When I started with my company as a supervisor, it took six years to make the same as the union employees under me. But do I really make more? They work eight hours a day with 70 minutes for breaks. I work 10-11 hours with no time for breaks. Is this fair?"

Quality of life improving

The relationship of employee morale to productivity has been proven over and over again, so it's no surprise that most progressive firms are trying to improve the working environment. Apparently, this trend also has taken root in the food industry.

When asked if the quality of life in the workplace was improving, staying the same or worsening, for example, 60.9% of our survey respondents said that it was improving. Only 5.4% felt it was about the same, and another 27.4% said it was worsening.

Of those who saw the quality of work life improving, the reasons given were varied. A vice president of manufacturing notes: "Our office has been renovated and the general atmosphere is more pleasant." And a project engineer who makes $36,200 after 12 years says things are better because "The company just built a new physical fitness center on the premises."

Of the 27.4% who saw the quality of life in the workplace worsening, the reasons cited included: low morale, no job security, mergers and acquisitions. Another reason for worsening conditions, cited by 16.2%, was too much work and fewer people. Staff reductions over the past few years have resulted in greater responsibilities for many food people. Thus, although they may be making more this year, say a large number of our respondents, they're working harder for it. In general, this trend to increased responsibility was more of a burden for those earning $25-40,000 per year.

A food technologist making $32,000, for instance, says his responsibilities normally were R&D. Now, he's involved with quality assurance and procurement. And a production supervisor for a medium-sized candy manufacturer in Pennsylvania reports that he has more responsibilities in all areas – quality assurance, safety, OSHA, FDA and corporate inspection, GMP, yields, held product, sanitation, etc.

Of the 60.0% reporting increased responsibilities, 30.2% said that a heavier work load was largely the cause. Another 39.3% gave no explanation. Of the 30.5% remaining, major reasons cited for the increase in responsibilities included: received a promotion; company growth; an increased or reduced staff; more new product development work being done; the company had reorganized (this also was the largest cause for a decrease in responsibility); increased regulatory compliance; use of new technology; and greater travel.

How we view the future

Your opinion of the quality of life in the workplace also shows that, in general, morale is good. Another measure of morale is how an employee feels about the future. And, once again, the signs are positive.

This year's respondents were enthusiastic about the future, with 75.3% of the total optimistic and only 19.4% pessimistic. An engineering manager in a very large Connecticut bakery, for instance, says: "The company is expanding and demand for my particular talents (developing specialized machinery) is quite high." And a food technologist in Oregon, who makes $34,400 after eight years, reports: "Fast growth is causing more recognition of R&D impor-

(Continued on page 49)

Median salaries by Food Industry experience

Years Experience	Median Salary
0-5 years	$34,000
6-9	36,000
10-14	41,000
15-19	46,000
20-24	48,000
25-29	48,000
30 or More	49,000

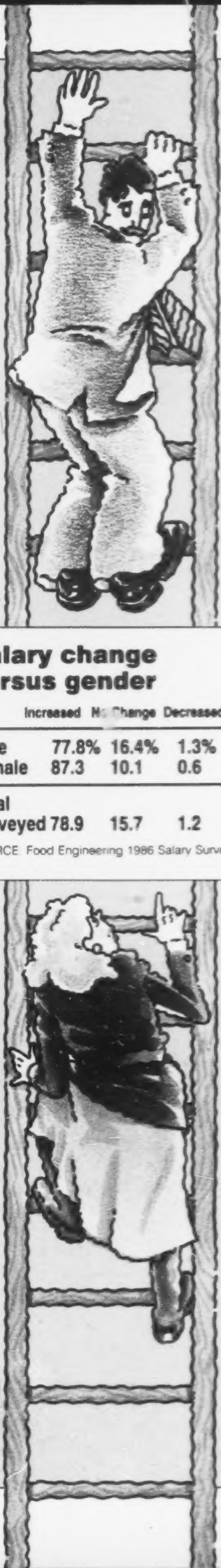
SOURCE: Food Engineering 1986 Salary Survey

Median salaries by product specialty

Product Specialty	Median Salary
Beverages	$44,000
Confectionery	44,000
Pasta	44,000
Grain Milling	43,000
Bakery	43,000
Dairy	42,000
Fruits, Vegetables	41,000
Fats & Oils	41,000
Meat	39,000
Seafood	38,000

SOURCE: Food Engineering 1986 Salary Survey

FOR FOOD INDUSTRY WOMEN, PAY IS IMPROVING—SLOWLY



Salary levels by gender

Annual Salary	Male	Female
$70,000 or More	95.2%	3.2%
60-69,000	96.9	2.1
55-59,000	92.1	6.3
50-54,000	96.1	2.9
45-49,000	94.4	4.2
40-44,000	92.3	5.6
35-39,000	87.1	11.3
30-34,000	83.7	14.2
25-29,000	78.3	20.3
Under 25,000	58.5	41.5
Total Respondents	1200	158

SOURCE: Food Engineering 1986 Salary Survey

Industry experience versus gender

Total Experience	In General Industry (% in range)		In Food Industry (% in range)	
	Male	Female	Male	Female
0-5 years	65.7%	33.6%	75.1%	4.1%
6-9	73.2	24.2	78.0	19.9
10-14	85.3	13.5	87.5	11.0
15-19	93.8	5.8	94.7	4.8
20-24	93.6	5.1	93.8	3.8
25-29	95.1	3.1	95.0	4.1
30 or More	95.6	2.4	97.2	1.1
Total Responses	1200	158	1200	158

SOURCE: Food Engineering 1986 Salary Survey

How we feel about the future

	Optimistic	Pessimistic	Neither
Male	75.1%	19.3%	1.5%
Female	76.6	20.3	1.3
Total Surveyed	75.3	19.4	1.5

SOURCE: Food Engineering 1986 Salary Survey

Salary change versus gender

	Increased	No Change	Decreased
Male	77.8%	16.4%	1.3%
Female	87.3	10.1	0.6
Total Surveyed	78.9	15.7	1.2

SOURCE: Food Engineering 1986 Salary Survey

Job responsibilities versus gender

	Increased	No Change	Decreased
Male	58.0%	37.5%	2.5%
Female	74.7	22.8	1.9
Total Surveyed	60.0	35.7	2.4

SOURCE: Food Engineering 1986 Salary Survey

Most of the women *FE* surveyed were in technical jobs, purchasing, and/or "Other." Most are in lower paying jobs, too, with 87.9% making less than $45,000 and only about 12% making more. Women generally lose out, also, on bonuses and incentive pay.

For a sales manager in Missouri, that means *currently* earning $10,000 per year less than the man she replaced 2½ years ago. "Plus," she adds, "he had a company car." Still, she appreciates the chance her company has given her to better herself.

Her optimism is shared by many others. For example, 76.6% of the women surveyed were optimistic, compared to 75.1% of the men. Likewise, 20.3% of the women were pessimistic, compared to 19.3% of the men. Sometimes it's hard to see a bright side.

A shift superintendent in Pennsylvania, earning $27,400 per year after 27 years, complains that "Male employees doing exactly the same job on the same shift are getting paid higher salaries." And a food technologist in Minnesota says that "More demands are put on working mothers, yet benefits do not increase at the same rate."

Geography has little to do with this viewpoint, though most of the women seem to work in metropolitan areas—the Mid- and South Atlantic, North Central and Pacific areas. Also, women appear to be less likely (11.4%) to work in a small company, and more likely (48.8%) to work in a mid-sized company. Wherever they work, however, the women feel that they aren't being given an equal chance to get ahead.

A manager of R&D says: "In our corporation, our only female director is in a traditionally female area of consumer services." And a purchasing manager laments that her firm hires "mostly higher-paid outsiders for jobs higher up the ladder."

But that may be changing. As the "gender" table with this article shows, part of the problem may be related to how long women remain in the workforce. The evidence seems to indicate that women do much better as they achieve seniority.

"I do find that in a few organizations, being a women still closes some doors," sums up a technical manager. "Overall, though, I feel very positive about the food industry."

Median salaries by company size

Number of Employees	Salary Median
Under 20	$39,000
20-49	36,000
50-99	36,000
100-249	38,000
250-499	41,000
500-999	41,000
1,000-2,499	42,000
2,500 or More	45,000
All Firms	$41,000

SOURCE: Food Engineering 1986 Salary Survey

How salaries compare to responsibilities

	Increased	Same	Decreased
Salary	78.9%	15.7%	1.2%
Responsibility	60.0	35.7	2.4

SOURCE: Food Engineering 1986 Salary Survey

tance and chance for advancement." Another Oregon food technologist explains: "At our company, the opportunities for individual achievement are limited only by your willingness to put out extra effort."

Morale is a personal thing

Where optimism and pessimism is concerned, the region of the country in which you work doesn't seem to be significant. Nor is the size of the company a factor, although those in smaller firms appear to be slightly more optimistic. Moreover, the responses tend to fall into a similar pattern as those for whether or not the quality of life in the workplace is improving or worsening.

Length of service isn't a significant factor in employee optimism. And neither is the branch of the food industry in which you work. And gender doesn't seem to mean very much either. For example, 76.6% of the women surveyed were optimistic, compared to 75.1% of the men surveyed. Likewise, 20.3% of the women were pessimistic, compared to 19.3% of the men.

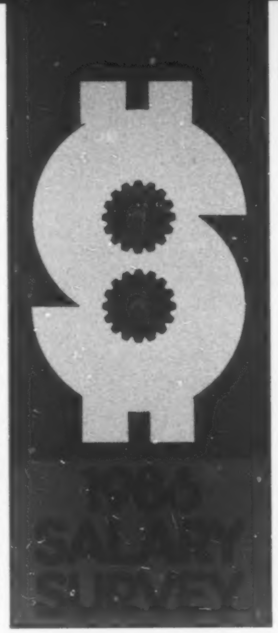
Although 48.4% of respondents gave no reason for their optimism, those who did emphasized faith in their company, the industry and their own ability to get ahead. For example, one cause cited by 9.6% of the optimistic group was that their company was expanding and/or growing. Confidence in their own ability to find another job was noted by 9.5%. Other reasons included: the opportunity for advancement is promising (5.5%); the company is good/progressive (5.1%); and the industry is growing (3.7%).

Generally, the reasons given for pessimism were the opposite, led by a lack of faith in the company, the industry and in themselves. And "no chance for advancement" was a leading reason. Among this pessimistic group, those with five or fewer years of experience and those with 10-19 years experience were nearly twice as likely to view the future with caution.

A bakery sanitarian with more than 30 years experience, for example, is extremely discouraged. "I feel I'm spinning my wheels," he says. "There are no real improvements in machinery or efficiency. It comes off the backs of the good workers." He blames fewer people and more work, longer hours and less pay for the lower morale.

There were a great number of references to stress and pressure on the job, too. Having too much to do, too little time to do it, and too little pay for your efforts takes its toll. This problem is being recognized, however. A purchasing manager in Tennessee points out that "Companies are becoming aware of stress in their managers and workers. But I believe more needs to be done for production employees."

A vice president of manufacturing for a firm in Arizona agrees, and adds: "The food industry has always paid less than other industries, but we've come a long way in the last few years. And salaries are going to keep getting better."



Median salaries by geographic location

Geographic Region	Median Salary	Geographic Region	Median Salary
Mid-Atlantic	$42,000	West North Central	40,000
West South Central	42,000	South Atlantic	39,000
Pacific	42,000	Mountain	39,000
New England	41,000	East South Central	38,000
East North Central	41,000	All Regions	$41,000

SOURCE: Food Engineering 1986 Salary Survey

Special Emphasis

DAIRY INGREDIENTS

EXPANDING USES OF MILK PROTEINS

Both the development of new and more functional milk proteins, and consumers' concerns for improved health are responsible for the increased use of milk proteins in foods.

ANN E. PRZYBYLA
Technical Editor

The resourcefulness of food scientists is especially apparent when it comes to dairy ingredients. New products such as highly purified whey protein isolates, milk protein hydrolysates to produce improved foams, and pH-stable sodium caseinates for emulsifying creamy juice beverages are aiding food processors in the engineering of new food products.

Most cheese in the U.S. is made by batch processing. Milk contains fat, casein and whey proteins, lactose, minerals, and water. Acid and/or enzyme treatment of milk results in the separation of curd (the fat, and some of the lactose, water, and minerals trapped by the coagulation of the casein) and whey (the remaining liquid with lactose, the whey proteins, minerals, and other minor constituents dissolved in it). The curd is further processed into cheese, with the whey remaining.

Since the 1960s milk proteins have been produced commercially for use as food ingredients. Whey, or serum protein, constitutes 20 percent of the proteins in milk. They differ from each other significantly in their molecular, physical, and functional properties. However, they are soluble at pH 4.6, whereas caseins precipitate out at this pH.

By heating whey at 180°F for 20 minutes, the whey proteins can be precipitated out. But a major advance in dairy ingredients came in the 1970s when ultrafiltration (UF) was used to concentrate whey proteins. The lower level of heat used in the process allows the recovery of whey proteins in a soluble form with better retention of nutritional and functional qualities. In the ultrafiltration process, whey is passed across a selective semi-permeable membrane. High mo-

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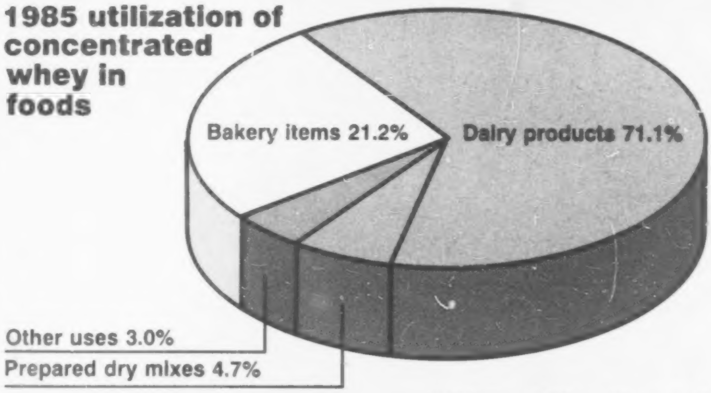
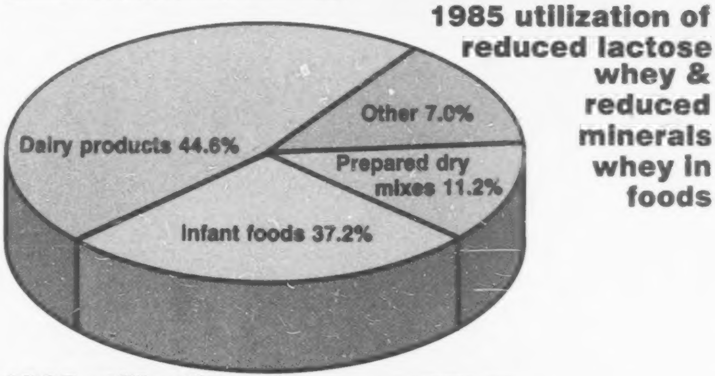
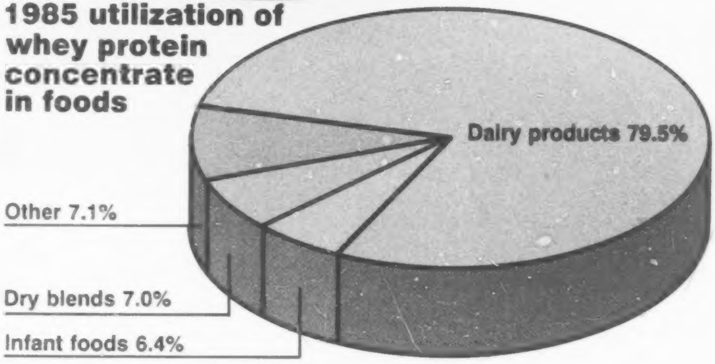

1985 utilization of concentrated whey in foods


1985 utilization of reduced lactose whey & reduced minerals whey in foods


1985 utilization of whey protein concentrate in foods

As the functionality of whey ingredients is improved, new applications are developed. The figures in these charts are based on a compilation of whey products usage through direct sales of manufacturers. The survey—conducted by the Whey Products Institute (WPI)—included WPI members, other cooperating processors, and resellers. It reflects approximately 86 percent of the USDA reported whey solids processed during 1985. 1986 figures will be available later this year.

lecular weight protein molecules (or whey protein concentrates) are retained on the membrane, while low molecular weight minerals and lactose particles (or modified whey solids) pass through the membrane.

Whey protein concentrates (WPC) are 50 to 80 percent protein. Their uses include: Protein fortification; as a filler to add bulk; as a bodying agent in drinks; and to help in areation of bakery products. Since whey proteins are sensitive to heat, they are often used in dry mixes. Since they do not precipitate in acidic environments, they are recommended for use in beverages which do not undergo high temperature processing.

Other applications and benefits of WPC include:

- *High solubility at any pH.* Therefore, WPC functions well as emulsifiers in salad dressings, dips, and sauces.
- *High water binding capacity of protein gel after heating in processed meats.* The gel strength varies on the amount of WPC used, the time/temperature conditions of processing, and any interaction with other ingredients used.
- *Possible reduction of cholesterol content by more than 50 percent when used as a milk or egg solids replacer in products such as quiche.* In these applications, WPC also eliminates inherent microbiological and handling problems innate to milk and eggs, in addition to offering a cost savings.
- *A well balanced amino acid content.*

Isolates 90% protein or more

Ultrafiltration increases the protein content of whey to approximately 60 percent protein. A di- or second filtration is used to produce concentrations as high as 80 percent protein whey. But recently, proprietary processes have been developed to further concentrate whey to 90 percent protein or higher. These products are referred to as whey protein isolates. Both Dairy Specialties and Le Sueur Isolates, Le Sueur, MN, offer whey protein isolates. (The photograph on the front page of this article is of *BiPRO*—whey protein isolate from Le Sueur Isolates).

Bio-Isolates, from Le Sueur Isolates, are produced by the use of ion exchange adsorption with specially developed high performance hydrophilic ion exchangers patented by the company. While any proteinaceous food process stream can be used as feedstock for the process, to date the company has focused on developing whey protein isolate from cheese whey. After concentrating through ultrafiltration and spray drying, a 95 percent whey protein isolate results.

Due the the higher cost of whey protein isolates over other whey products, they are recommended for applications requiring a low level of fat and lactose, and high protein fortification needs. Suggested applications include: sodium free ice cream; egg replacements that do not need to be refrigerated; and protein reinforced drinks with no off-flavor.

Altered by hydrolysis

One way in which milk proteins are modified to provide specific properties is through hydrolysis. New Zealand Milk Products, Petaluma, CA, has developed *Milk Protein Hydrolysate 985* for use as a whipping

(Continued on page 54)

agent. It is designed to be easily dispersed at high solids. And unlike some whipping agents that may require time for hydration prior to use, it disperses immediately.

The primary role of a whipping agent in aerated desserts and confections is to: Entrap the air being introduced into the mix; produce a uniform dispersion of the air cells within the product; lower the specific weight of the products; and provide considerable modification of the texture, explained Deborah A. Rolf, food scientist at New Zealand Milk Products. Egg albumen has the longest history of use as a whipping agent in the food industry, but fluctuating and often high price is a concern.

A comparative study of several commercial whipping agents and Milk Protein Hydrolysate 985 was conducted by the manufacturer. Whipping overrun, foam stability, and final nougat density were determined for each product. Whipping overrun is a measurement of the amount of air that has been incorporated into the mix and foam. Stability is a measurement of the time in

(Continued on page 56)

As the popularity of cheese increases, food processors are incorporating it in more processed foods. Photo courtesy of Borden Corp.

New cheeses increase usage

Cheese is back in vogue! New and expanding choices of cheeses—especially Italian styles and gourmet cheeses—were a major force in the increased consumption of cheese last year.

U.S. manufacturers of cheese saw a 5.5 percent increase in sales to $10.7 billion in 1965, according to Commack, NY-based Business Trend Analysts' new report—*The U.S. Cheese Market: A product-by-product marketing analysis and competitor profile*. The report continues to point out that per capita consumption of both imported and domestic cheese increased to 24.0 pounds, and is expected to total 25.4 pounds this year.

"Processed and imitation (or substitute) cheese products did not have the outstanding appeal for which industry affiliates had hoped, even in light of their reductions in calories, cholesterol, and sodium," continued the report. "Natural cheeses (excluding cottage cheese) totaled about $6.4 billion in U.S. manufacturers' sales in 1985 and are projected to grow at an average annual rate of 10 percent through 1995. In terms of sales, natural cheeses comprised 60 percent of the total cheese figure in 1985."

One particular category of cheeses which continues to grow in popularity is Italian cheeses. Per capita consumption in this category of cheese has grown from 3.3 pounds to 5.8 pounds during the last decade, according to another BTA report on dairy products.

Among the more popular Italian cheeses are mozzarella and ricotta. The use of ricotta has grown as the "pizza generation" has discovered the appeal of other Italian entree and dessert items, points out Phil Fass of Universal Foods Corp. But the popularity of pizza also has been a major factor in increased cheese consumption—especially its use on frozen pizzas and in food service operations (see *Food Engineering*, Oct. 1986, p. 12).

New products in this area have been developed to aid food processors using these popular Italian cheeses. Normally characterized by high moisture and short shelf-life, a line of Italian specialty cheeses has been developed by Universal Food with the moisture content reduced to approximately four percent resulting in a longer shelf-life.

Another development is Hi-Melt Process Cheeses from Kraft Industrial Foods. Tests have shown that a two-inch cube of Hi-Melt held at a temperature of 300°F for 10 minutes retains its flavor and well-defined edges. Recommended uses include value-added Italian foods.

which the foam remains stable. The company's results showed significant functional and economical benefits by using Milk Protein Hydrolysate 985.

Modifications of caseins

Another commonly used dairy ingredient is caseinates, or modified forms of casein – the milk protein used in cheeses. Caseins are not produced in this country except for a limited government sponsored program to produce casein from excess skim milk. The reason for this is the cost would be prohibitive. Caseins are, however, produced in other parts of the world where government subsidiaries allow them to be sold for a competitive price.

Casein can be isolated from milk by adjusting the pH to 4.6, or through the action of the enzyme rennet. Soluble caseinates are formed from caseins by either raising the pH and/or using sequestering agents. The functionality of the resultant caseinate can be manipulated by using different ions.

Sodium caseinate is highly viscous, a good film former, and a good emulsifier, points out Kurt L. Frey, manager – business development for New Zealand Milk Products. Recommended applications include whipped toppings and cream liqueurs. Calcium caseinate is less viscous and forms an opaque solution. A typical application would be a diet beverage where a low viscosity is desired. Potassium caseinates have similar properties to sodium caseinates but can have a bitter taste. They do have applications where reduced sodium is desired, and other flavors in the final food system help mask their taste.

Both high calcium whey protein concentrates and calcium caseinates offer a means to increase the calcium content of foods by using a milk-derived calcium source. And with the current concern among women in obtaining enough calcium in their diets, this could have positive marketing benefits.

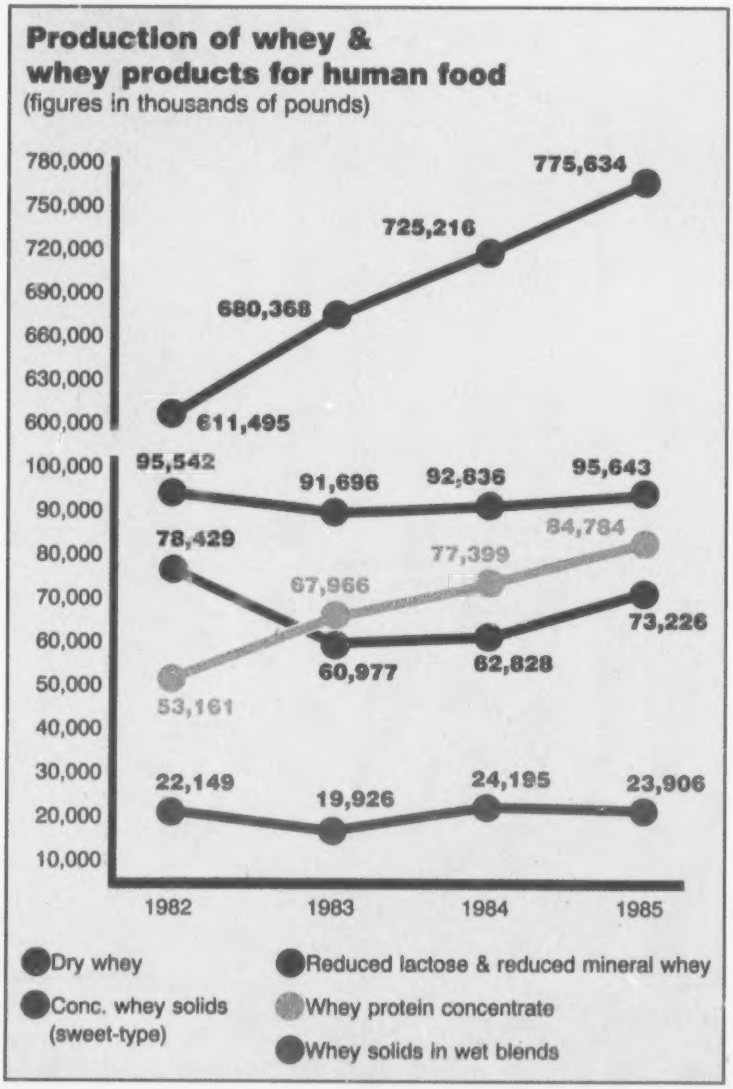
UF milk for cheese

While ultrafiltration of whey is fairly common in this country, ultrafiltration of milk prior to cheese making – which is becoming increasingly popular in Europe – is done only on a limited basis here. Labeling restriction in this country is the reason for this. The *Standards of Identity*, published by the U.S. Food and Drug Administration, were amended in 1985 to allow for certain cheeses made with UF milk. It does stipulate, though, that this cheese must be organoleptically and nutritionally equivalent to cheese made by traditional processes.

To date, the FDA has not sanctioned any cheese made from UF milk as organoleptically and nutritionally equivalent to traditional cheese. If FDA did, however, the supply of whey could be reduced. But, since the cost of converting a cheese plant from traditional cheese making to the UF process is very expensive, most likely only new cheese plants would be set up to manufacture cheese from UF milk.

So even *if* UF processed cheese becomes acceptable in this country, no dramatic changes would be seen in milk protein ingredients – at least not for a long time. Whey and other dairy ingredient will continue to provide numerous functions in foods such as film and gel former, thickener, water binding, emulsifier, offering freeze/thaw stability, and aid in providing the desired texture.

Overall production of whey products has increased during the past several, although slight declines have occurred in specific types. These figures are based on a survey conducted by the Whey Products Institute and represents approximately 86% of the USDA reported whey solids processed during 1985. 1968 figures will be available later this year.



Production of whey & whey products for human food
(figures in thousands of pounds)

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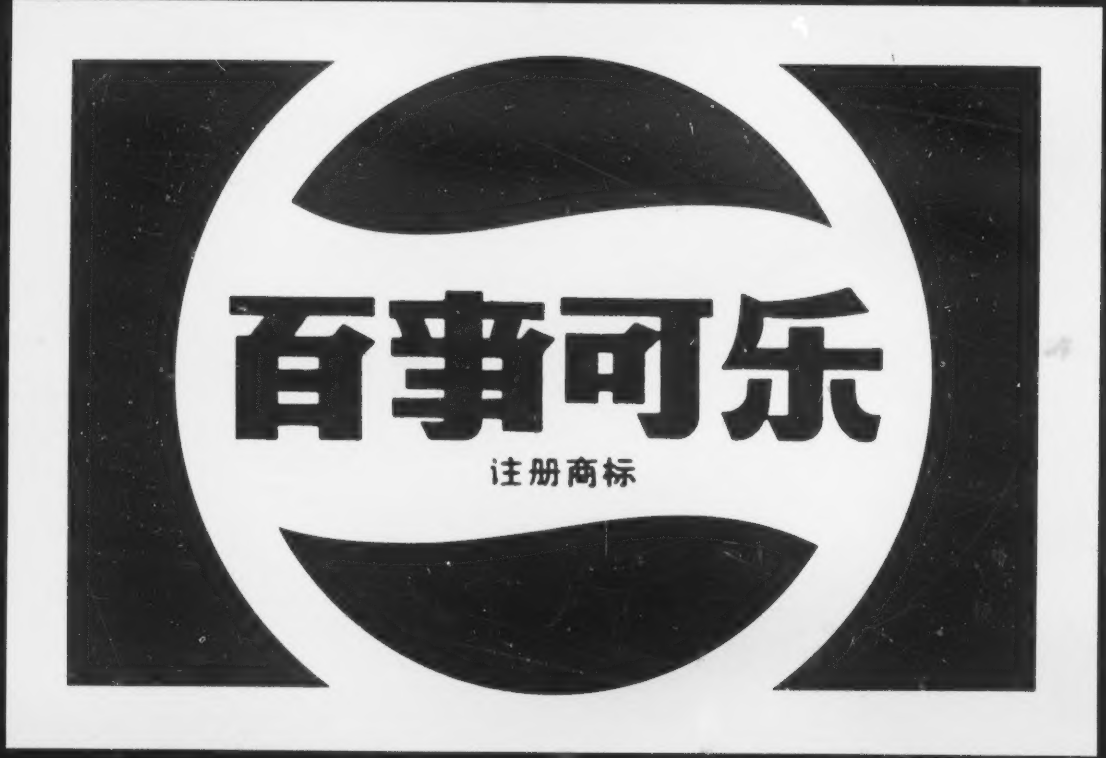

COMPETING IN A GLOBAL ECONOMY

Analytical Flavor Testing
IEFP Pre-Show
PMMI Post-Show

FOOD ENGINEERING

COVER STORY

The U.S. ecomony has been replaced by a global economy. Today, American food processors are grappling with a global economy just like their colleagues in many other industries.

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This month's Report discusses power realignments due to industry mergers, acquisitions and divestitures; FDA clearance of four more food categories; how family spending for food is linked to employment in the tobacco industry; and FDA labeling regulations for cholesterol.

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INSTRUMENTATION ADVANCES BENEFIT FLAVOR INDUSTRY

Advances in instrumentation and methodology are enabling the flavor industry to detect frauds.

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Mergers/acquisitions activity produces power realignments

Mergers, acquisitions and divestitures in most areas of the food industry were up 3.6 percent over the last nine months, according to a report from The Food Institute.

The industry's restructuring continues, for example, to produce significant power realignments in the soft drink industry. Coca-Cola acquired JTL Bottling and the bottling operations formerly owned by Beatrice—creating a major company-controlled bottling network that is to be partially spun off into a separate operation. And PepsiCo acquired the Kentucky Fried Chicken chain from Nabisco.

Each of the two soft drink giants also made purchases north of the border: Coca-Cola purchased the Canada Dry operations in Canada from Cadbury Schweppes, while PepsiCo acquired the Seven-Up operation in Canada, as well as the bottling rights worldwide, excluding the U.S.

At the same time in the soft drink industry, the investment firm of Hicks & Haas engineered the acquisition of Dr Pepper from Forstman Little. Hicks & Haas also owns A&W Root Beer Brand. Recently, Hicks & Haas acquired Seven-Up from Philip Morris, creating a new soft drink empire.

And another contender in the soft drink industry, RJR Nabisco, sold its soft drink operations.

Quaker sets record

Another major food processor, Quaker Oats, outbid rival Ralston Purina for Anderson Clayton & Co., primarily for its Gains pet foods business, leaving the fate of other food properties, such as Chiffon margarine and Seven Seas salad dressing, undetermined at this time. Approximately $800 million was spent in acquiring Anderson Clayton, setting a new record for Quaker. Earlier this year, Quaker had acquired Golden Grain Macaroni Company for $250 million.

In the food service industry, the largest acquisition of 1986 so far has been the purchase of Saga Corp. by Marriott, making Marriott the nation's largest contract food service firm.

Food Business Mergers & Acquisitions

First Nine Months – 1986

Category	Total No. of Acquisitions
Bakers	12 (12)
Brewers	6 (4)
Confectioners	5 (2)
Dairy Processors	6 (13)
Diversified Firms with interests in the food industry	34 (23)
Food Processing Firms	75 73)
Poultry Processors	8 (6)
Primary Product Cos.	14 (8)
Retailers	
Convenience	16(17)
Supermarket	28 (14)
Other	9 (6)
Seafood Processors	3 (2)
Snack Food Processors	1 (7)
Soft Drink Bottlers	11 (11)
Sugar Refiners	2 (2)
Total	230 (207)

Note: The numbers in parentheses indicate number of transactions through the first nine months of 1985.

Source: The Food Institute

Food industry mergers and acquisitions were higher than any previous nine-month period. Here is the total for the first nine months of 1986.

Supermarket activity up

The Food Institute's nine month record shows that activity in the supermarket industry is running at a rate twice that of the same period in 1985. The number two U.S. supermarket chain, Safeway Stores, was taken in a leveraged buyout by the investment firm of Kohlberg, Kravis, Roberts & Co. Kroger, the leading U.S. supermarketer, is divesting its drug store operations. Stop & Shop Companies also sold its drug store and tobacco shop businesses.

The industry was busy in New York where the Great American Atlantic & Pacific Tea Company purchased the Shopwell chain, adding 53 stores in the metropolitan New York market. Also in New York, the Gristede chain of 36 units was sold by Southland Corporation to Red Apple Supermarkets.

Tax program gives businesses a break

The new tax bill will make the federal Targeted Jobs Tax Credit Program more important than ever, according to a California firm specializing in helping companies fight tax red tape.

The federal program allows employers to claim a tax credit of 40 percent of the first $6,000 in wages paid to employees in specific groups, as long as the application is filed before the employee begins work.

According to The Alameda Company, Alameda, CA virtually any business that hires entry level employees can benefit, but as few as 4-5 percent use the credit because they dislike the paperwork.

Sixty-five percent of the eligible new hires are people 18 to 24 years old with low incomes. Others are Vietnam veterans, handicapped persons, and general assistance recipients.

Food Bank distributes surplus foods

Food companies, who manufacture too much food, over or underfill packages that can't be used, or are left with food that just doesn't look right,

By donating surplus food to a food bank, companies can avoid destroying food that cannot be sold to consumers, but is still edible.

Sugar: Has it taken a bad rap for too long?

Sugar: How Much Consumers Eat Every Day

Sugar Type	Daily Intake grams/day	% of Total Calories
Fructose		
Added	10	2
Naturally occurring	7	2
TOTAL*	16	4
Sucrose		
Added	28	6
Naturally occurring	13	3
TOTAL	41	9
Sugars from corn sweeteners		
HFCS	19	4
Others	6	1
TOTAL*	24	5*

Total is not equal to the sum of "added" and "naturally occurring" due to rounding.

SOURCE: Sugars Task Force, FDA

This chart shows the amounts of both added sweeteners and naturally occurring sweeteners being consumed daily.

The Food and Drug Administration is making confectioners smile. In a report compiled by the FDA Sugars Task Force, the agency contends that, yes, carbohydrate sweeteners are safe.

Thanks to the news, sugar can no longer be called "sweet and dangerous" or "pure, white and deadly," contends the Sugar Association, Inc. "The report is good news because it unequivocally sets the record straight," says Sugar Association head, Jack O'Connell.

The task force, which evaluated all the safety data available on carbohydrate sweeteners, found that the only negative side effect of sugar is something we've known all along: it contributes to dental caries. The group also addressed these health issues:

- Does sugar cause diabetes? Evidence says no, and, according to the Sugar Association, researchers are now questioning the rationale for sugar-restricted diets, once automatically recommended for diabetics.
- Does sugar make children hyperactive? Again, evidence says no.
- Does sugar consumption contribute to obesity? Evidence shows that no one food is responsible for obesity, and even suggests that lean people tend to eat more sugar then overweight persons do.
- Can consumers eat sugar and not worry about nutrient deficiencies? Yes, says the report.

Concludes the study: Carbohydrate sweeteners, consumed at today's levels (see accompanying charts), do not pose a health hazard.

Caloric Sweeteners

U.S. Per Capita Consumption in Pounds 1980-1986

	Sugar, Refined	HFCS	Glucose	Dextrose	Honey	Edible Syrups	Total
1980	83.6	19.1	17.6	3.5	0.8	0.4	125.0
1981	79.4	23.2	17.8	3.5	0.8	0.4	125.1
1982	73.7	26.7	18.0	3.5	0.9	0.4	123.2
1983	71.1	30.7	18.0	3.5	0.9	0.4	124.6
1984	67.6	36.3	18.0	3.5	1.0	0.4	126.9
1985	63.3	43.5	18.0	3.5	1.0	0.4	129.7
1986*	60.9	44.7	18.0	3.5	1.0	0.4	128.5

*estimated
SOURCE: Economic Research Service, USDA

A recent FDA task force study concludes that carbohydrate sweeteners consumed at today's levels do not pose a health hazard.

95% fat-free beef to be marketed

Completely chemical-free beef with 5 percent less fat than chicken is to be distributed in the Maryland and D.C. area by Mash's Meats of Baltimore and Landover. "UltraBeef" is up to 46 percent lower in fat than corresponding cuts of beef, translating into a calorie content of only 120 calories per 3-ounce serving. (See *FE*, Oct., p. 66.)

The cost-competitive beef is produced via a controlled breeding and selection process. Chesapeake Genetics, Inc., Centerville, MD established a joint venture with UltraBeef Ranches, Inc., based in South Dakota, with the two companies pooling knowledge and resources on cattle breeding. The companies exercise quality control over every step, beginning with breeding and production, and continuing through retail marketing.

Transplanted embryos

The program uses only Simmental bulls, known for their ability to produce lean beef without loss of quality grade. The procedure uses embryos transplanted from "donor" cows into the wombs of other cows which act as surrogate mothers. This frees the donor cows to produce as many as 30-40 calves per year – all with superior genetics. UltraBeef calves reach slaughter weight (1150-1250 pounds) by 13 or 14 months of age, 7 to 11 months earlier than other cattle.

California passes bottle bill alternative

California's new recycling act is a compromise between traditional forced deposit legislation and voluntary recycling. The program has a one

(Continued on next page)

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cent redemption value on containers and is designed to provide an incentive to recycle all products, not just beverage containers.

Under the new law, consumers who return containers to recycling centers are guaranteed at least a penny returned, and possibly more if the market price of aluminum and glass dictates it. The goal is to recycle 65 percent of all glass, aluminum and plastic beverage containers. According to the author of the bill, only 10 percent of glass bottles, 50-60 percent of aluminum cans and 2 percent of plastic bottles are now recycled.

The bill contains a series of "penny triggers" that will gradually increase the redemption value, beginning with one cent, and potentially rising to two cents by 1989 and three cents by 1992. The triggers will take effect only if the 65 percent recycling rate is not reached for each container.

Study reviews changes in food retailing market

According to a report from the Food Institute, sales by food retailers, both food stores and commercial eating and drinking places, should amount to $430 billion for 1986. The Institute's latest annual report on the food retailing industry, "Food Retailing Review: 1986," analyzes changes in consumer spending, income growth, food prices, and performance at retail food stores and commercial eating and drinking places.

According to Frank Panyko, Institute vice president, "New forces are at work in the marketplace, with convenience being the key for two-income households, singles, and other identifiable consumer groups."

The study tracks the changing product mix at grocery stores (and the impact on retailing), citing data on product movement, and a feature highlighting the leading restaurant chain firms. Also included are the Food Institute's annual compilations on the top 20 supermarket companies, per capita food store and eating out spending by region, as well as a review of additional research produced throughout the industry.

The report is available from the Food Institute at 28-12 Broadway, Fair Lawn, NJ 07410.

Food Engineering to begin co-sponsoring seminars

In an effort to support the broad and detailed delivery of manufacturing technology information pertinent to the food industry, *Food Engineering* magazine will begin co-sponsoring short courses to be given by the Center for Professional Advancement located in East Brunswick, NJ. The Center has been active since 1967 in intensive two- to five-day courses in applied industrial technology, and currently carries 500 on its books. Over thirty of those are food technology and related courses, everything from "Food Microbiology" to "Retortable Food Packaging."

The Center's main classrooms are located in East Brunswick, but it also offers in-company courses that can be given at a food maker's facility, as well as offering executive briefings: One-day meetings for senior management on leading-edge topics that will impact the food industry in the future. Over the last several years, CPA has become active in Europe, offering courses out of its Amsterdam offices.

Said a *Food Engineering* spokesman, "We think this is the right fit at the right time. CPA is looking to deliver the same kinds of information to the same kinds of people in the same ways that the magazine is. But they can do it in greater depth and with greater personalization. Our co-sponsorship is a natural extension of what we do now. It is part of a total industry commitment that goes much further than just publishing the magazine."

The first block of courses to be offered under *Food Engineering*'s co-sponsorship will be:

- "Baking Technology" – Feb. 9-12
- "Confectionary and Chocolate Production" – Feb. 23-26
- "Sensory Evaluation" – March 2-5
- "Food Texture Technology" – March 9-11
- "Nutritional Aspects of Food Processing" – March 9-11
- "Moisture Management in Food Systems" – March 19-20.

For additional information on these courses, contact The Center for Professional Advancement, P.O. Box H, East Brunswick, NJ 08816-9987. Phone: 201-238-1600. Telex: 139303 (CENPRO EBRW).

Tobacco industry controls more than $3.3 billion in U.S. food processing

According to a study by Chase Econometrics, Philadelphia, PA, family spending for food in the United States is linked to employment in tobacco, its supplying sectors and the providers of their consumer goods and services. Altogether the tobacco industry accounted for $3.32 billion in food processing and production gross receipts in 1983, the latest year for which complete information is available. These gross receipts also indirectly supported 6,000 food processing jobs paying $62 million in wages and fringe benefits, Chase added.

The $3.32 billion in successive consumer spending on processed food production represented almost 1.2 percent of the total value of manufactured food production in 1983.

The recent acquisitions of General Foods and Nabisco Brands by tobacco firms will increase these figures.

Tobacco Industry Importance to Food Processing Industry

(1983 production in $millions by industry segment)

Meat packing	$437
Cheese	205
Fluid milk	185
Bottled & canned soft drinks	173
Bread & cake	146
Frozen fruits & vegetables	132
Poultry dressing	96
Shortening & cooking oils	79
Fresh & frozen fish	64
Flour & grain mill products	60
Rice milling	47

The tobacco industry has generated $3.32 billion in gross receipts for the food industry in 1983. The chart indicates a partial breakdown of these receipts.

GLOBAL ECONOMY

GRAPPLING WITH A GLOBAL ECONOMY

The role of the United States in the world food market has shifted radically from that of supplier to consumer—of food, food capital and food technology. Can we regain a competitive edge?

Once "the world's market basket" as the leading exporter of food, the United States is now a net *importer* of food. The nation's 1986 agricultural trade surplus of $5.4 billion was offset—though marginally—by a $5.6 billion trade deficit in processed foods.

Once a cornucopia of capital for building food industries abroad, the U.S. food industry now attracts more foreign investment than it spends abroad. Foreign ownership of the U.S. food industry now exceeds American ownership of food industries overseas by nearly $1.9 billion.

Once the technological genius of the globe, the U.S. has watched its technology base erode in favor of foreign competition. Most new food processing and packaging technology now comes from overseas. Major reason: Our top competitors outspend us in R&D. "The Germans, the French, the Japanese are all spending about 2 percent of their GNP on (non-military) R&D; we spend about 1-1/2 percent," said Dr. Lester C. Thurow, professor of economics at the MIT Sloan School of Business, at the 1986 National Food Processors Association convention in Atlanta. "We spend most of ours on new products; our competitors are spending a much larger fraction on *new processes*." Thurow's Axiom: "A German engineer with money is better than an American engineer without money."

CHARLES E. MORRIS
Midwest Editor

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Pepsi-Cola recently started its second bottling plant in China. (Source: Pepsico)

Bottom line: "The American economy has died, and has been replaced by a world economy," said Thurow.

American food processors today are grappling with a global economy just like their colleagues in the automotive, consumer electronics, machine tool and semiconductor industries—all high-tech, not "smokestack" industries.

On the farm front, in spite of export incentives built into the 1985 Farm Bill, "many observers still have doubts about whether U.S. agriculture will be able to recapture international markets," said Robert L. Thompson, Assistant Secretary of Agriculture for Economics, at a conference ad-

Value of foreign investment in U.S. food industry doubled in the past five years, reflecting in microcosm the shift of the United States from creditor to debtor nation.

The Shifting Pattern: Foreign Ownership of U.S. Food Industry Surpasses U.S. Ownership of Foreign Food Industry
(Billions of dollars)

	1981	1982	1983	1984	1985
U.S. direct investment abroad	N/A	7.63	7.66	8.16	9.30
Foreign direct investment in U.S.	5.72	6.64	7.45	8.27	11.17

Source: U.S. Dept of Commerce

dressing the competitive position of Southern agriculture, November 5 in Atlanta. "[They] ask whether U.S. agriculture has permanently lost its international competitiveness."

The Big Question: Faced with an incredible federal budget deficit (a record $220.7 billion in fiscal 1986); an immense trade deficit (projected by Secretary of Commerce Malcolm Baldridge at a record $172 billion for 1986) and slower productivity growth (0.3 percent vs. 3 to 5 percent for our major foreign competitors in 1985) – can the U.S. compete in the world marketplace?

Money magnet

According to Commerce Department figures published in August 1986, foreign direct investment in the U.S. food industry now exceeds U.S. direct investment in the food industry abroad, reflecting in microcosm the shift of the United States from a creditor to a debtor nation.

As shown in the accompanying table, foreign investment in the U.S. food industry nearly doubled from $5.7 billion in 1981 to $11.2 billion in 1985; it surpassed U.S. food investment abroad in 1984 and by 1985 exceeded U.S. overseas investment by $1.9 billion. Major reason for the leap in 1985: Nestle's $3 billion acquisition of Carnation.

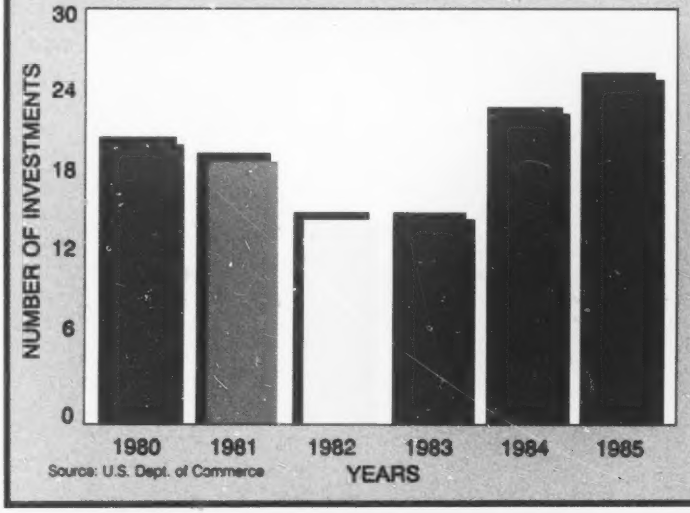
Reasons for the influx of foreign capital:

- The strength of the dollar in the early '80s. High interest rates here attracted foreign investment. (This further bolstered the dollar and made U.S. products more costly abroad, contributing to the decline in U.S. exports.)
- U.S. economic recovery following the 1981-82 recession, which continued to make U.S. investment attractive even when interest rates declined.
- The profitability of the U.S. food industry. U.S. packaged food stocks have outperformed the market since 1980 and in 1984 passed the S&P 500 in actual as well as relative performance. Net income of a group of packaged-food companies, tracked by the Chicago investment consulting firm Duff & Phelps, grew from slightly under $2 billion in 1981 to $2.4 billion in 1985, will increase by 10 percent in 1986 "and double that next year (1987)" to about $3.2 billion, said Vice-President John C. Bierbusse at a Duff & Phelps investment conference Nov. 7th.
- Huge trade surpluses in major EEC nations and Japan, which have generated the funds for foreign investment. Japan will record a 1986 trade surplus of about $86 billion, West Germany about $51 billion.

According to the International Trade Administration (ITA), these factors supplemented traditional reasons – a large, homogenous market and political stability, for example – for investing in the U.S. Although the dollar fell 36 percent against key foreign currencies between February 1985 and October 1986 to reduce the value of income from investments in the U.S., "direct investments typically represent a

(Continued on page 78)

Number of Foreign Investments In The U.S. Food Industry, 1980-85



Source: U.S. Dept. of Commerce

International Food/Beverage Sales

Selected U.S. Companies (Latest Fiscal Year)

Company	Int'l Food/ Bev. Sales ($ Millions)	% Total Food Bev. Sales	% Food Assets Abroad
Beatrice[1]	1,700	29.3	10
Borden[2]	361	11.3	—
Campbell Soup	890	20.3	27
Coca-Cola	3,000	62	25
General Foods[3]	2,000	20	—
Heinz	1,601	37	39
Kellogg	855	29	40
Kraft	1,733	24.5	33
Pepsico[4]	952	11.8	18
Pillsbury	434	14.3	9.5
Quaker Oats[5]	821	22.4	—
Ralston Purina[6]	753	12.8	9.5

Notes:
[1] FY '86, prior leveraged buyout
[2] Includes non-food consumer products; excludes Canada
[3] General Foods only, not including beverage operations of Philip Morris
[4] Includes restaurants
[5] Not including Canada
[6] Includes feed, pet foods

Sources: Annual reports; companies

long-term commitment to do business in the U.S. and thus do not appear to be materially influenced by short-term fluctuations in the value of the dollar," said the ITA.

Foreign invasion

As shown on the accompanying graph, foreign investments in the U.S. food industry jumped from 13 transactions in 1983 to 23 in 1984 and edged-up to 25 in 1985. Of the 23 identified by the ITA in 1984, 11 had known values totaling $146.9 million. Only eight of the 25 transactions recorded in 1985 reported values, but these totaled $3.2 billion because of the Nestle/Carnation deal.

Foreign investments are tabulated on

(Continued on page 80)

More value-added commodities such as flour, soybean meal, soybean oil and corn gluten must be shipped to boost the value of U.S. agricultural exports. (Photo: Staley Continental)

Top 20 Foreign Food Firms in U.S.—1982
(More than 50% foreign owned)

Company	Country	Products/Operations	Est. U.S. Employment
Nestle Alimentana*	Switzerland	Cheese, canning, frozen specialties, chocolate, candy, coffee, yogurt, tea	6,367
United Biscuit Holdings**	UK	Baking, cookies, crackers	5,600
Grand Metropolitan, Ltd.	UK	Pet foods, soft drinks	5,302
Unilever, Ltd.	UK Netherlands	Ice cream, canned specialties, seasonings, corn milling, macaroni, tea, dried soup, margarine	4,079
Seagram Co., Ltd.	Canada	Alcoholic beverages	2,864
Imperial Group, Ltd.	UK	Poultry processing, feed, ice cream, candy	2,777
Hanson Trust, Ltd.	UK	Meat packing, animal oils	2,228
Cadbury Schweppes***	UK	Canning, candy, chocolate, soft drinks	2,160
Northern Foods, Ltd.	UK	Meat processing	2,105
Reckitt & Colman, PLC****	UK	Wine, mustard, seasonings, instant potatoes	1,988
Allied Lyons, PLC	UK	Ice cream, flour, tea, chips	1,664
Rank, Hovis & MacDougall, Ltd.	UK	Canning, pasta products	1,463
Bunge Group	Belgium	Corn milling, soybean processing	1,346
Dalgety, Ltd.	UK	Frozen fruits & vegetables, flour mixes	1,028
Suntory, Ltd.	Japan	Soft drink bottling	728
Henkel, Kgaa	West Germany	Canned mushrooms, salad dressings, soft drinks	727
Tengelmann	West Germany	Coffee, baking, fluid milk, frozen fruit	716
Canadian Pacific, Ltd.	Canada	Animal & vegetable oils	711
Kyokuyo Co., Ltd.	Japan	Canned fish	705
Koninklijke Wessanen NV	Netherlands	Dairy products	693

*Prior Carnation acquisition
**Prior acquisition by Imperial Group Ltd.
***Prior Canada Dry and Sunkist Acquisitions
****Prior Acquisition of Durkee from Hanson Trust
Source: USDA, 1985 (Based on 1982 data)

these pages as follows:

1.) Foreign investments in the U.S. food industry, 1984-85. Of the 48 transactions identified, 28 were acquisitions or mergers, two were joint ventures. The others involved equity increases, new-plant construction or expansions of existing plants.

2.) Foreign acquisitions in the U.S. food industry, 1986. This lists acquisitions only as tracked by The Food Institute through mid-November, when this story went to press.

But, as in 1984-85, there were other foreign investments in 1986 beyond acquisitions. A few examples:

- Heartland Lysine, a Chicago-based joint venture between Ajinomoto of Japan and Eurolysine of France, started up a new lysine plant early in 1986 at Eddysville, IA.
- Golden Cheese Co. of California (*FE*

Foreign Investments in U.S. Food Industry—1984-85

Year	U.S. Firm	State	Product(s)*	Foreign Investor	Nation	Type Investment	Value ($ millions)
1984:	Barengo Winery (Vinegar Div.)	CA	Vinegar	Nakano Vinegar Co.	Japan	Acquisition/merger	—
	Bartlett Springs	CA	Soft drinks	Nestle	Switz.	Acquisition/merger	5
	Canada Dry (franchise)	NH	Soft drinks	Kirin Brewery	Japan	Acquisition/merger	11.5
	Chateau Elan	GA	Wine	Pandoz, Donald	Ireland	New plant	12
	Chateau St. Jean	CA	Wine	Suntory	Japan	Acquisition/merger	40
	Dhul Corp.	CA	Ice cream, frozen desserts	Dhul Corp.	Spain	New plant	—
	El Molino Mills	CA	Flour, meal	Booker McConnell PLC	UK	Acquisition/merger	5
	Fanny Farmer Candy Shops	OH	Candy, confections	Poulain Industries	France	Acquisition/merger	—
	Heluva Good Cheese	NY	Cheese	Koninklijke Wessanan	Neth.	Acquisition/merger	—
	Joan of Arc Co.	IL	Canned fruits, veg.	Raffinerie Tirlemontoise SA	Belgium	Acquisition/merger	38
	Keebler Co.	NC	Biscuits, crackers	United Biscuit Holdings	UK	Additional investment, type unknown	—
	Kibun Corp.	NC	Surimi products	Kibun Co.	Japan	New plant	—
	Kibun Corp.	WA	Surimi products	Kibun Co.	Japan	New plant	—
	Lotte USA, Inc.	MI	Candy, confections	Lotte Co.	Japan	Plant expansion	—
	Moxie Industries	GA	Soft drinks	Peter Eckes	W. Germany	Equity increase	1.3
	Nissin Foods USA	PA	Pasta products	Nissin Food Products	Japan	Plant expansion	2.1
	Paul F. Beich Co.	IL	Candy, confections	Nestle	Switz.	Acquisition/merger	—
	Pearl River Chinese Foods	IA	Poultry processing	Gov't of China	China	New plant	—
	Red Cheek, Inc.	PA	Canned fruits, veg.	H.P. Bulmer Holdings	UK	Acquisition/merger	—
	Red Wing Company	NY	Canned fruits, veg.	Mitsui & Co., Ltd.	Japan	Plant expansion	10
	Sea Galley's Meat Proc.	WA	Prepared meats	Alberta Pork Mktg. Bd.	Canada	Acquisition/merger	—
	Shedd's Food Products	MI	Veg. oil products	Unilever PLC	UK	Acquisition/merger	16
	Supreme Feed Supplements	CA	Animal feed	Mitsui & Co., Ltd.	Japan	Acquisition/merger	6
1985:	Akzo Chemie America	WI	Corn wet milling	Akzo NV	Neth.	Joint venture	—
	Beatrice Ag. Products	IL	Animal feed	Tate & Lyle PLC	UK	Acquisition/merger	43

Mar., '86), an American-owned company, started up a $110-million cheese, protein, butter and alcohol plant operated by Express Foods, Inc., a subsidiary of Grand Metropolitan Ltd. in London, in late 1985 at Corona, CA. Grand Met USA is reportedly building a new $75-million cheese plant at Fresno.

- An $8-million pasta-snack plant was started up in mid-1986 at Joliet, IL by U.K.-based Rank, Hovis, MacDougall.
- A $4-million snack-food plant started in York, PA as a joint venture between Meiji Seika Kaisha and D.F. Stauffer Biscuit Co.

As this story went to press, another giant acquisition—only partly food—was in the works. Unilever, jointly based in the Netherlands and the U.K., had outbid American Brands for a $3.1 billion takeover of

(Continued on page 82)

Year	U.S. Firm	State	Product(s)*	Foreign Investor	Nation	Type Investment	Value ($ millions)
1985:	Breddo Food Products	MO	Bread, bakery products	Centrale Suikermaatschappij	Neth.	Acquisition/merger	—
	Carnation Co.	CA	Dairy products	Nestle	Switz.	Acquisition/merger	3000
	Dahlgren & Co.	MN	Shortening, cooking oils	Gov't of France	France	Acquisition/merger	—
	Early California Foods (olive unit)	CA	Canned fruits, veg.	United Biscuit	UK	Acquisition/merger	73
	Ford Gum & Machinery	NY	Chewing gum	Huhtamaeki OY	Finland	Acquisition/merger	—
	Great Western Sugar (six plants)	TX	Beet sugar	Tate & Lyle PLC	UK	Acquisition/merger	21.5
	Great Western Sugar (Seed div.)	CO	Beet sugar	Cardo AB	Switz.	Acquisition/merger	4.3
	Heim Cheese Co. (plant)	WI	Cheese	Breese Bleu Fromageries	France	Acquisition/merger	—
	Hills Bros. Coffee	CA	Coffee	Nestle	Switz.	Acquisition/merger	—
	Jacobs Coffee Co.	WI	Coffee	Jacobs Suchard AG	Switz.	—	—
	Johanna Farms	NJ	Dairy products, juices	John Labatt Ltd.	Canada	Acquisition/merger	—
	Master's Brewing Co.	IL	Malt beverages	Molson Cos., Ltd.	Canada	—	—
	MJB	CA	Coffee	Nestle	Switz.	Acquisition/merger	—
	Morinaga Nutritional Foods	CA	Milk products	Morinaga Milk Ind. Co.	Japan	—	—
	Nissin Foods USA	PA	Pasta products	Nissin Food Products	Japan	Plant expansion	—
	National Starch & Chemical Corp.	KS	Modified starch	Unilever NV	Neth.	New plant	—
	PMP Co.	IL	Malt beverages	Fujisawa Pharmaceutical	Japan	Acquisition/merger	—
	Premium Beverages	CT	Flavorings	Seagram Family	Canada	Acquisition/merger	—
	Probat US, Inc.	TN	Coffee	Probat-Werke Von Gimborn	W. Germany	—	—
	Stouffer Corp.	UT	Frozen foods	Nestle	Switz.	New plant	100
	Streptococcus Lab	IA	Animal feeds	Bonnierforetagen AB	Switz.	Joint venture	1
	Theresa Friedman & Sons	PA	Canned fruits, veg.	Rank, Hovis, MacDougall	UK	Acquisition/merger	10
	Western Sugar Co.	CO	Beet sugar	Tate & Lyle PLC	UK	—	—

*By SIC Code
Source: U.S. Dept. of Commerce

Chesebrough-Ponds, including its Ragu Foods unit.

Americans still big abroad

Foreign ownership of the U.S. food industry might now exceed U.S. ownership of the food industry abroad, but—according to *U.S. Industrial Outlook, 1987* (figures released December 30 by the Commerce Dept.)—American multinationals currently supply 40 percent of foreign food investment. Of U.S. food investments abroad, only acquisitions are tabulated in this article. But U.S. food processors were striking several other types of deals around the world. Examples:

- Heinz-UFE Ltd., a joint venture between H.J. Heinz Co. and two provincial organizations in China, started-up a baby-food plant at Guangzhou last summer.
- Central Soya Co. on December 3 announced it would acquire seven U.S. soybean processing plants from Belgian-owned Bunge Corp.
- As part of restructuring aimed at fending off a takeover threat by Revlon Chairman Ronald O. Perelman, CPC International announced it would seek a buyer for its European corn-processing operations, which account for about $1 billion in sales—nearly a quarter of CPC's volume.
- Adolph Coors signed a licensing agreement with Japan's Asahi Breweries to brew and distribute Coors in Japan.
- RJR Nabisco started up a joint-venture cracker plant at Beijing, China.
- Fresh Start Bakeries, a unit of Staley Continental, is building a bun plant in West Germany to supply McDonald's restaurants there.
- Pabst entered a joint-venture to set-up a brewery at Shenzen, China, to serve both mainland and Hong Kong markets. According to Industrial Outlook '87, Pabst will dismantle its shut-down plant in New Jersey and reassemble it in China.
- Anheuser-Busch licensed production of Budweiser to Watney's in the U.K., Guiness in Ireland and United Breweries in Demark.
- ADM is reportedly negotiating a joint venture to build a soybean-processing plant in the Soviet Union. Earlier Soviet restrictions against foreign joint ventures have apparently been lifted by the Gorbachev government.

Major U.S. food processors are also boosting capital investment in farms and food plants south of the border to take advantage of lower raw-material and labor costs, and are importing both ingredients and finished-food products from these areas. General Foods, Campbell Soup and Pillsbury, for example, operate plants in Mexico and South America. This "international sourcing" contributes to rising agricultural imports but also contains U.S. consumer prices. Imports such as canned tomato paste, frozen broccoli and cauliflower from Mexico soared earlier in the decade but slumped dramatically in 1986, possibly due to an improvement of the peso against the dollar.

Global mergermania

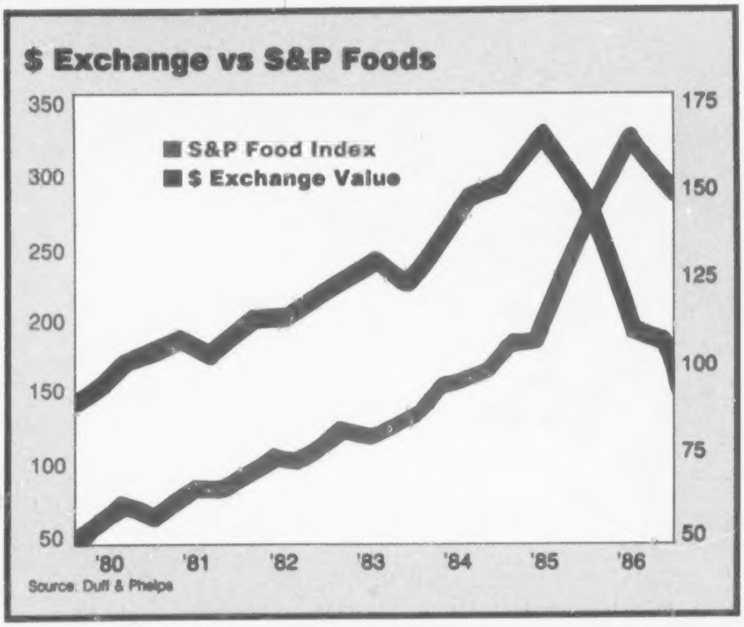
A brief review of our accompanying tables reveals several trends:

—Mergermania is not confined to the United States. Acquisition is the fastest route to establishing a food business in another industrialized nation "where there's something to acquire," observes William V. Janis, an economist who tracks the food industry at the ITA. But while that may be true for developed nations, "joint ventures are more common in developing nations such as China."

—The highest percentage of international acquisitions involving U.S. firms were with English-speaking nations. Of the 122 total transactions tabulated here, 46 were with the U.K., Canada, Australia and Ireland. Large English firms such as Unilever, Hanson Trust, Imperial Group, Reckitt & Colman, Tate & Lyle, Rank, Hovis, MacDougall and Cadbury Schweppes were especially active.

(Continued on page 84)

Recent decline of the dollar against major foreign currencies has boosted sales and profits of U.S. packaged-food companies by making their products less expensive abroad, but it is also making foreign investments more expensive.



Source: Duff & Phelps

– Swiss-based Nestle, who has been operating here for 87 years and is by far the largest foreign-owned food company with 28,000 employees at 126 different U.S. locations (including Stouffer hotels and restaurants), has been very active in acquiring American firms. Beyond the widely publicized Carnation takeover, Nestle has been involved in six other transactions since 1984, including the acquisition of Hills Bros. and MJB coffee companies. Nestle merged MJB into Hills.

– The Japanese are on the move. Although some Japanese firms have operated here for many years (C. Itoh for more than a century, for example), a 1985 USDA report listed only 12 Japanese-owned food processors operating here as late as 1982. But Japanese activity is accelerating. Since 1984, Japanese companies have been involved in 13 transactions – six acquisitions, four plant expansions, two new plants, one joint venture and one unreported. Largest to date: Suntory's $40-million acquisition of the Chateau St. Jean Winery in California. Kibun has built two surimi plants here; Nissin has twice expanded its pasta plant at Lancaster, PA, where it makes noodle soups. (Japanese firms have reportedly captured 9 percent of the U.S. dry-soup market.)

Some observers envision the day when

Foreign Acquisitions in U.S. Food Industry—1986
(Through mid-November)

Foreign Firm	Country	Acquisition	Location	From (if parent firm)	Products/ Operations	Value ($ millions)
Arabian Int'l. Banking Corp.	Bahrain	Delwood foods	Yonkers, NY	—	Dairy products, chocolate	51
BP Nutrition (Div. British Petroleum)	UK	Purina Mills, Inc.	St. Louis, MO	Ralston-Purina	Domestic animal feeds	—
Burns, Philip & Co.	Australia	Fleischmann's yeast, vinegar brands	Chicago, IL	RJR Nabisco	Yeast, vinegar	—
Cadbury Schweppes	UK	Canada Dry, Sunkist brands	International except Canada	RJR Nabisco	Soft drinks	230
Champlain Ind.	Canada	Keratene HVPs	Winsted, CT	McCormick	Hydrolyzed veg. proteins	—
		Yeast Products, Inc.	Clifton, NJ,	—	Yeast	—
Chr. Hansen Lab.	Denmark	Licenses for acidophilus, low-lactose milk products	—	Gundlach Corp.	Milk products	—
C. Itoh Co.	Japan	Pacific Pearl brand	Edmonds, WA	Seawest Ind.	Canned seafood	—
Gerber Cheese Co. (Sheffield, CT, div. of Thux Co.)	Switzerland	Imported Cheese brands	—	Nestle	Cheese	—
Haarman & Reimer	W. Germany	Aroma ester products	—	Monsanto	Esters	—
Imperial Group PLC	UK	United Biscuit PLC (includes Keebler Co., Specialty Brands Inc.)	UK	—	Cookies, crackers baked goods	1,940
James Cream Co.	Ireland	Freezer Queen Div.	Bells, TN	United Foods	Frozen entrees	35
John Labatt, Ltd.	Canada	Boden Products	Chicago, IL	—	Fruit juices, drinks	—
		Pasquale Foods	Birmingham, Al	—	Pizza, pasta	—
Johanna Farms (Flemington, NJ, sub. of Labatt)	Canada	Atlanta Process.	Allentown, PA	—	Milk products, juices	—

the Japanese apply the same market research savvy to the U.S. food industry which they applied to capture 22 percent of U.S. automobile sales. "What the Japanese can bring to the party...would be improved manufacturing technology and control," said Richard Rakowski, president of the consulting firm of Princeton Technologies, at the 1986 NFPA convention. "But what they don't have—and readily admit—is a very good sense of the American sensory taste. So I'm not concerned about the Japanese in the American market with a manufacturing edge unless and until they have access to American taste. And once they did, I'd be *incredibly* concerned."

Ag exports down

According to USDA, U.S. agricultural exports in 1986 fell to $26.3 billion, down nearly $5 billion from 1985 and more than one-third from the $44 billion peak year in 1981.

Imports rose $1.2 billion from a year earlier to $20.9 billion. Although the nation finished the year in the black with an agricultural trade balance of $5.4 billion, the fact is that for two or three months during 1986—depending on whether you use USDA or Commerce figures—the U.S. actually registered deficits in agricultural trade, the first monthly deficits in 27 years.

(Continued on page 86)

Foreign Firm	Country	Acquisition	Location	From (if parent firm)	Products/ Operations	Value ($ millions)
Koninklijke Wassanen	Netherlands	J. E. Cain Co.	Ayer, MA	—	Pickles, dressings, condiments	—
McCain Foods	Canada	Int'l Fruit of Massachusetts, Inc.	Taunton, MA	—	—	—
National Sea Products, Ltd.	Canada	Booth and Fisher Boy brands	Chicago, IL	Rich Seapack	Frozen seafoods	13
Nestle	Switzerland	Canadian pet-food operations	—	RJR Nabisco	Pet foods	—
Plumrose, Inc. (East Asiatic Co.)	Denmark	Dak Foods	E. Brunswick, NJ	Prestige Foods (Div. Northern Foods, Ltd., UK)	Processed meats	16.8
Reckitt & Colman PLC	UK	Durkee	Cleveland, OH	Hanson Trust, PLC	canned fruits & vegetables, frozen foods, snacks, bakery products, ingredients	120
Rhone-Poulenc	France	Vanillin products plant	Seattle, WA	Monsanto	Vanillin	—
R. T. French (Rochester, NY div. Reckitt & Colman)	UK	Pure Foods Co.	Mamaroneck, NY	—	Beef bouillion	—
Swan Brewing Co.	Australia	Pittsburgh Brewery Co.	Pittsburgh, PA	—	Beer	24
Unilever	UK, Netherlands	Anderson-Clayton SA, Industriae Commercio	Mexico Brazil	Anderson-Clayton	Veg. oil products	109.1
		J. H. Filbert Co.	Baltimore, MD	Central Soya	Margarine, salad dressings	—
Weetabix, Ltd.	UK	Barber's Bakery Co.	Novato, CA	—	Bakery products, snacks	—

Source: The Food Institute

"With this decline in exports, farm product prices have been depressed, land values have plummeted, financial distress has grown, and the cost of federal farm programs...has soared," said Assistant Agriculture Secretary Thompson. Major reasons:

–Supply exceeds demand. World agricultural production capacity exceeds both current and prospective demand.

–Technological progress has raised world productivity generally. "There is plenty of food produced in the world; people go hungry because they lack purchasing power," Thompson pointed out.

–Global recession in the early '80s.

–Price-support programs enacted by foreign nations to boost productivity and exports.

–Export subsidies and import restrictions by foreign producers.

(Continued on page 88)

U.S. Acquisitions in Foreign Food Industry—1984-85

Year	U.S. Firm	Acquisition	Location	From (if parent firm)	Products/ Operations	Value ($ millions)
1984:	Beatrice Foods, Ltd. (Beatrice Foods)	York Ice Cream	Toronto, Ont.	Canada Packers, Inc.	Ice cream, frozen novelties	—
	Beatrice Foods	Minimarche, France & Stute	W. Germany	—	Fruit juices, jams; food distribution	—
	Campbell Soup	D. Lazzaroni S.p.A.	Italy	—	Cookies	—
	Central Soya	Victory Soya Mills	Toronto, Ont.	Proctor & Gamble	Cottonseed, soybean crushing	—
	Coca-Cola	C.C. Soft Drinks, Ltd.	UK	Grand Metropolitan PLC	Coca-Cola bottler	43.3
	ConAgra	Remaining 50% of Country Poultry, Inc.	US	Imperial Foods, Ltd. (U.K.)	Poultry products	18
	CPC Int'l. (Canada Starch Co.)	Zymaize Co., in joint venture with Casco Co.	London, Ont.	John Labatt, Ltd.	Corn starches	—
	Dixie Yeast Corp. (Mgmt. group)	Leveraged buyout	Gastonia, NC	Burns, Philip Ltd. (Australia)	Baker's yeast	—
	McCormick & Co.	Paterson Jenks PLC	UK	—	Specialty foods processor; beverage distributor; broker	53.5
	Nabisco Brands, Ltd. (Nabisco Brands, Inc.)	Associated Biscuits of Canada, Ltd.	Toronto, Ont.	—	Biscuits, cookies	—
	Pillsbury Co.	Goldstein Biskuit AG	W. Germany	—	Frozen cakes	—
		Jaus Frozen Foods	W. Germany	—	Frozen cakes	
	Proctor & Gamble	Outstanding shares of Crush Canada, Inc.	Toronto, Ont.	Great Pacific Industries, Inc.	Soft drink bottling	—
	Proctor & Gamble Gmbh	Rolf H. Dittmeyer Co.	W. Germany	—	Fruit juices	—
	RiT-Chem Co.	Saccharin business of Kum Yang Co., USA	S. Korea	Kum Yang, Ltd.	Saccharin	—
	Smithfield Foods	Patrick Cudahy, Inc.	Cudahy, WI	Prestige Food Corp. (Sub. Northern Foods PLC, UK)	Meat packing	—
	W. R. Grace Co.	Cocoa-processing plant	Singapore	Allied Cocoa Industries	Cocoa	—

–The 1981 Farm Bill, which made it more profitable for American farmers to produce for the Commodity Credit Corporation (CCC) than for export.

"In effect," said Thompson, "the U.S. withdrawal of exports from world markets...supported world prices at a higher level than otherwise would have been found," even with foreign subsidies. The 1985 Farm Bill has started to dismantle this artificial support to let world prices fall by 25 percent or more in 1986, he added.

New environment for the late 1980s: Lower commodity prices in spite of foreign export subsidies; U.S. export incentives "including loans, so the U.S., too, is playing this game." But, he cautioned, we cannot continue trying to outsubsidize one another without pushing costs up sharply.

In the meantime, Thompson continued, the U.S. must:

1.) Boost agricultural R&D. Biotechnology and genetic engineering, for example,

(Continued on page 90)

U.S. Acquisitions in Foreign Food Industry—1984-85 *(Continued from page 86)*

Year	U.S. Firm	Acquisition	Location	From (if parent firm)	Products/ Operations	Value ($ millions)
1985:	Campbell Soup	Raised equity in Arnott's, Ltd. to 10%	Australia	—	Cookies	—
	Farwest Fisheries	Canned salmon operations of Whitney-Fidaigo Seafoods	Seattle, WA	Kyokuyo Co. (Japan)	Canned salmon	—
	Gai's Seattle French Baking Co.	Venice Bakery	Vancouver, BC	—	Bakery products	—
	Genessee Brewing	Fred Koch Brewery	UK	Vaux Breweries PLC	Beer, ale	—
	Kraft	75% of Invernizzi S.p.A.	Italy	—	Cheese, butter, meat products	—
		Everest Group	Australia	—	Pasta, frozen entrees, ice cream, frozen novelties	—
	Larry Ballen (company organized by)	Richardson Mint line, Philadelphia plant of Leaf, Inc.	Bannockburn, IL	Huhtamaki OY (Finland)	Candy	—
	McCormick & Co.	Industria E. Commerci Jimmi, Ltd.	Brazil	—	Sauces, mustard, pickles, condiments	—
	Pillsbury (Pillsbury UK Ltd.)	Fiesta Foods	UK	—	Desserts	—
	Pillsbury (Grupo Olazabal-Pillsbury)	Mac' Ma SA	Mexico	—	Cookies	—
	Pillsbury	R.T. French potato products	Rochester, NY	Reckitt & Colman PLC (UK)	Processed potato products	—
	Prince Macaroni	Aunt Millie's Sauces, Inc.	Congers, NY	Specialty Brands, Inc. (div. of United Biscuit PLC, UK)	Sauces	—
	Sara Lee (Douwe Egberts)	Jacqmotte and Chat Noir coffee brands	Belgium	—	Coffee	—
		Soley coffee brand	Spain	—	Coffee	—
	Sierra Spring Water Co.	Pure Water Industries Western, Ltd.	Edmonton, Alb.	—	Bottled water	—

Source: The Food Institute

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hold great promise for agriculture. Nations who proceed will improve their competitive positions.

2.) Unmask underlying competitiveness. The 1985 Farm Bill "took a large step in this direction" by dropping loan rates to market levels, eliminating a problem which was pricing us out of the international market.

3.) Eliminate acreage-reduction programs, which inflate the value of farmland and boost production costs.

4.) Cut interest rates to farmers, their largest single cost of production. "Real creativity is needed here" to restructure loans in such a way that both farmer and farm-lender can survive.

5.) Eliminate protectionism in those sectors of our economy where it exists so Third World nations with a comparative trade advantage can reduce their massive debts and buy American farm products, where we have a comparative advantage.

'Mirror Image of Japan'

Thompson takes issue with those who see the trade deficit as evidence that the U.S. has lost its competitive edge. Basic problem, says Thompson: The federal deficit, which not only creates the trade deficit but attracts foreign investment and further causes non-competitiveness by absorbing capital which might otherwise be available to the private sector for R&D. "Under floating exchange rates, a country running a net capital inflow must, of necessity, generate a current account deficit of the same magnitude," Thompson explained. "As long as conditions causing a net capital inflow exist, the U.S. will inevitably run a balance of

U.S. Acquisitions in Foreign Food Industry—1986
(Through mid-November)

U.S. Firm	Acquisition	Location	From (if parent firm)	Products/ Operations	Value ($ milions)
Anheuser-Busch	51% of San Miguel Brewery	Hong Kong	—	Licensed bottler of San Miguel, Lowenbrau, Chinese-brand beers	—
Anheuser-Busch	Lamont Winery	DiGeorgio, CA	John Labatt (Canada)	Wine	—
ADM	3 vegetable oil plants	Netherlands, W. Germany	Unilever (UK)	Soybean oil	—
Coca-Cola	Canada Dry bottling operations	Canada	Cadbury Schweppes (UK)	Soft drinks	90
ConAgra	Canadian Harvest Processors, Ltd.	St. Thomas, Ont.	—	Fiber foods from grain	—
CPC Int'l.	Wheat Industries, Ltd.	Cork, Ireland	—	Glucose, wheat gluten	—
Florasynth	Industri Chemica Sostanza Aromatich	Milan, Italy	—	Fragrances	—
Galetti Bros.	Certi-Fresh Foods	Los Angeles, CA	George Weston Co. (Canada)	Frozen seafoods	—
General Foods	20% of President Enterprises	Taiwan	—	Processed foods	30
Leaf, Inc.	Maple Leaf BV	Amsterdam, Netherlands	—	Chewing gum	—
Pepsico	International 7Up bottling operations	Ottawa, Toronto, Ont.	Philip Morris	Soft drinks	246
Pillsbury	Biscuiterie Vinchon-Jeanette	Caen, France	—	Bakery products	—
	Biscuiterie Minimax	Diest, Belgium	—	Bakery products	—
	NV Brockmans Co.	Diest, Belgium	—	Bakery products	—
	Conservas Chisti	Spain	—	Canned vegetables	—

Source: The Food Institute

trade deficit of the same size."

Thompson points to Japan, with its big trade surplus and high savings rate producing capital it can't absorb, as the "mirror image" of the U.S. with its big deficits and low savings: Exchange rates have adjusted as necessary to offset the Japanese surplus with the U.S. deficit.

Daniel E. Shaughnessy, president of the Export Processing Industry Coalition (EPIC), points out one reason for the tremendous decline in the value of agricultural exports: Huge shipments of raw grains as opposed to value-added commodities such as flour, soybean oil and meal, poultry and gluten. Concentration of exports at the low-value end of the scale costs the U.S. dearly in jobs, sales and tax revenues. Basic problem: Foreign export subsidies which have captured major shares of U.S. markets for these value-added commodities. EPIC advocates selectively-targeted subsidized exports as authorized under PL 480 "to signal that the U.S. is committed to protect itself in the marketplace" until – and unless – forthcoming General Agreement on Tariff and Trade (GATT) talks effectively deal with agricultural issues.

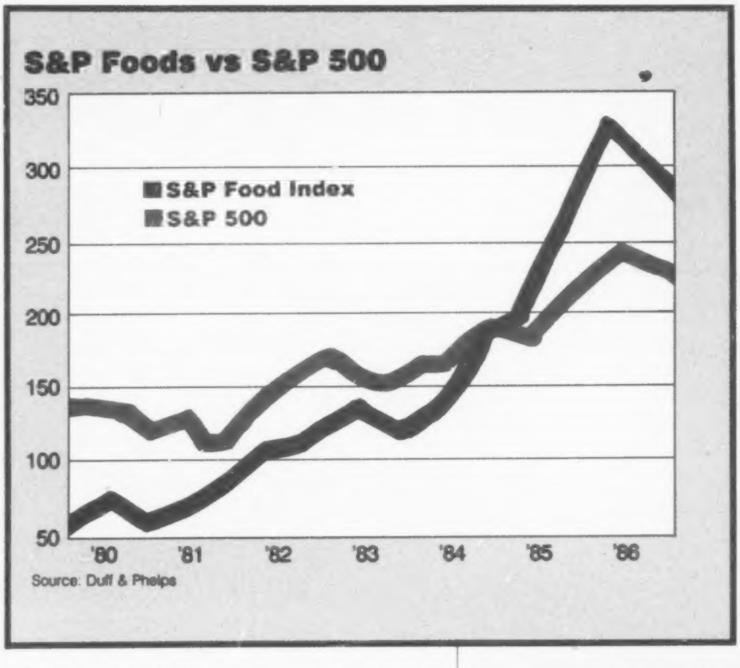
USDA projects little improvement in the agricultural picture for 1987, however. Exports should decline slightly to $26 billion, imports to $20 billion for a slightly improved surplus of $6 billion. "We're forecasting increased volume, but it washes out on value," said a spokesman. "It's nothing to crow about."

Processed food deficit

According to the Department of Commerce's (DOC) *Industrial Outlook, 1987*, U.S. exports of processed foods and beverages rose 5 percent in 1986 to $10.8 billion but imports rose 2.4 percent to $16.4 billion for an estimated $5.6 billion trade deficit in processed foods – about the same as the adjusted 1985 deficit. (The 1985 deficit, originally estimated at $3.9 billion, was revised because both imports and exports – mainly of processed seafoods – were originally overstated, said a DOC spokesman.)

Five nations accounted for nearly half of the markets for U.S. exports: Japan (20 percent), Canada (9 percent), The Netherlands (9 percent), Mexico (5 percent) and South Korea (4 percent).

The top five suppliers of U.S. imports are Canada (13 percent), Brazil (10 percent), France (7 percent), the U.K. (5 percent), Australia (5 percent). One reason for the processed-foods deficit: More than half the imports were high value-added products, while two-thirds of exports were low in added value.



Source: Duff & Phelps

One reason for growing foreign investment in the U.S. food industry: U.S. food stocks have consistently outperformed the market since 1980, especially during the past year.

Processed food exports, however, are of little importance to major food processors, most of whom operate subsidiary companies abroad and have for many years. Heinz, for example, celebrated its 100th anniversary in the U.K. last year. An accompanying table lists the international food sales for major U.S. processors who report these figures.

Innocents abroad

How do smaller food processors who have never operated overseas break into the global market?

Sources queried by *Food Engineering* concur there is no formula – the international market with its varying cultures, tastes, regulations and trade restrictions is too complex for pat answers. But they agree on two basic approaches: 1.) Do your homework, and 2.) Use all available private and government resources, some underutilized. "You have to evaluate your objectives and your resources, then make the time and financial commitments," says Roger Morf of Zunder Co., acquisition consultant.

Adds Jane Fisher, marketing director for the Dairy & Food Industries Supply Association: "The international market offers tremendous opportunities for food processors willing to spend the time, the money and the effort to go after it. Companies spend a lot of time motivating their domestic sales forces, but the international market is usually an afterthought."

CHINA TRADE

Food companies have found China difficult, but who ever said a vast opportunity would be easy?

One billion people. By the latest available estimate, the population of China is 1,037,588,000. That's why the government is planning to spend $2-3 billion by 1991 to update its food processing industry. And that's why food companies are so interested in setting up there.

To put China's population into perspective, consider this extrapolation from a leading canmaking company, Ball Corporation. If every man, woman, and child would drink one can of beer—or soda—per day, China would need 800 high-speed can lines. There are only 408 in the entire world.

With such an enormous market and government support, food companies should be clamoring to get into China. Many are, but more have decided to stay away. Is China difficult to reach? Is the effort justified? What exactly does it take to set up a plant in China?

To answer these questions, we contacted several food companies and suppliers to the food industry involved with China.

A look at the market

Although the case histories will describe typical food plants in China, they say little about the Chinese market itself. In a recent edition of the *China Business Review*, Linda Gramling, head of the General Industries program for the National Council for U.S.—China Trade, reviewed what the Chinese want and need.

The Chinese food processing industry has always been quite large, currently ranking third. Food processing is loosely defined. It usually means any business that converts agricultural goods into another edible form. Value-added may or may not come into the picture. However, the Chinese are most interested in high-technology. What one finds in China five years from today will be vastly different.

The State Economic Commission would like to see the output of the food industry multiply five times by the year 2000. In terms of yen, the Commission would like an increase from 60 billion yen in 1980 to 300 billion.

The Chinese have targeted certain foods to achieve this ambitious goal. These foods are processed meats, bean products, edible oils, pastries, sweets, dairy products, preserved fruits, juices, and baby foods (H.J. Heinz is heavily involved with a baby food plant in Guangdong).

Lately, authorities have begun examining the typical Chinese diet. Early findings show it lacking. A survey by Chinese dieticians revealed that while calorie counts

(Continued on page 116)

The Turfan plant in Northwest China is said to be the first to process melon juice. Up to 400 kg of juice concentrate per hour can be made from Hami melons indigenous to the area.

JIM WAGNER,
International Editor

were sufficient, the typical Chinese diet is laden with cereals and deficient in meat, fish, and dairy products. Calcium is a problem—children are currently getting only half the recommended daily amount.

To change these deficiencies, China plans to upgrade its meat and dairy industry. It will start by setting up new grazing areas, improve livestock feed processing, and renovate large and medium size dairies. Some work is underway already. A Chinese-Swedish training center for the production and processing of milk was inaugurated this year in Beijing. The center was carry out product development on dairy products in general since China is so limited, but will also research soy-based products, aseptic packaging and processing, and infant foods. The center is the result of cooperation between the Swedish University of Agricultural Sciences and the Chinese Ministry of Agriculture. In addition, Alfa-Laval donated milking systems for the 250 cows kept at the center, and process equipment for the dairy.

Some statistics

Sometimes the most revealing facts are actual production statistics. For example, only 300,000 tonnes of meat—only 10% of slaughtered animals—are processed annually in China. Milk consumption is on the rise, reaching 4.4 million tonnes in 1984, up 13% from the year before, but remains far behind Europe. Milk formula for infants are being improved with the addition of more vitamin D and iron.

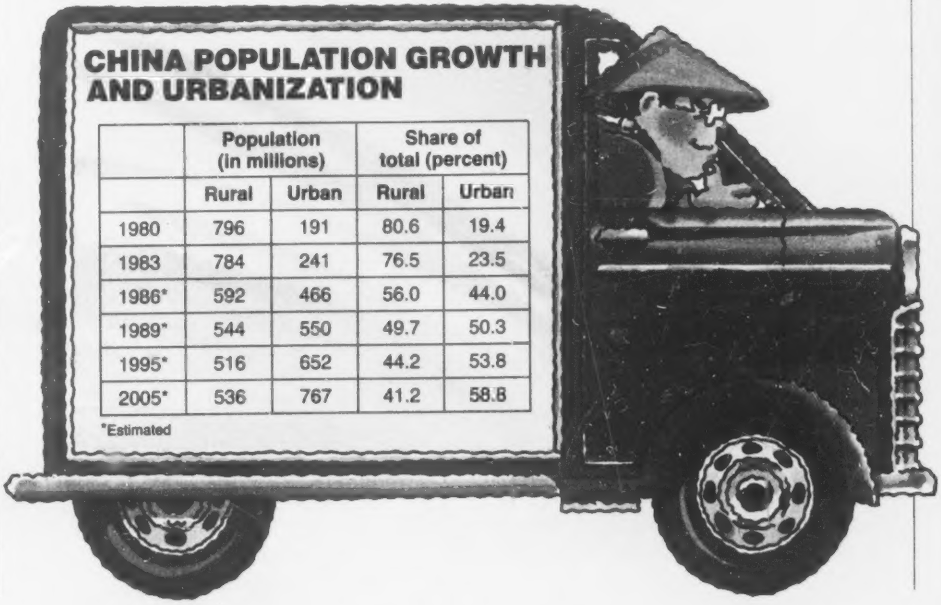
Only 8% of China's fruit crop goes to processing, and spoilage is a major problem. One expert estimates as much as half of China's agricultural output spoiled before reaching consumers. Each year about 300,000 tonnes of defective and wind damaged fruit could be made into high-quality byproducts such as preserves or juices, according to Linda Gramling.

Since May, 1985, the average price for fresh pork in Beijing rose nearly 50% and fresh beef 120%. Meanwhile, canned meat products remained stable. Thus, canned foods are gaining in popularity. The Chinese are growing accustomed to the idea that canning at harvest time keeps the price relatively lower and stabilizes shortages. In 1984, retail sales of canned foods exceeded exports for the first time. Sales hit 878 million yen, compared to 856 million yen generated by exports.

There is an especially telling statistic not related to imports or exports, but the quality of Chinese life itself. Typical Chinese households spend three to four hours a day buying, cleaning, and preparing food. That effort is rapidly becoming burdensome. For instance, when the government shortened the official noon rest period (the *Xiuxi*) from 2-1/2 hours to one, workers suddenly found themselves in need of convenience foods. The demand for instant noodles ran so high, the Beijing Food Industry Corporation boosted its working day from one to three shifts in three months.

Little wonder more food companies are looking at China.

One key to economic growth in a country like China is improved communication and transportation. Another, however, is the level of urbanization, one of the strongest impetuses to a consumer economy because of ease of distribution to large concentrations of population. Below is the way Rock Creek Research in Washington, D.C. sizes up the situation.



CHINA POPULATION GROWTH AND URBANIZATION

	Population (in millions)		Share of total (percent)	
	Rural	Urban	Rural	Urban
1980	796	191	80.6	19.4
1983	784	241	76.5	23.5
1986*	592	466	56.0	44.0
1989*	544	550	49.7	50.3
1995*	516	652	44.2	53.8
2005*	536	767	41.2	58.8

*Estimated

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FOOD ENGINEERING

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Tampering

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COVER STORY

The impact of a tampering incident on food firms can be devastating. The best prescription for neutralizing the damage is preparation.

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This month's Report features the 10 award winners from the DuPont Awards for innovation in packaging. The winning designs represent important breakthroughs in packaging. The Report also discusses predictions of slightly smaller raises for nonunion employees; the EEC trade war; a new packaging show debut; and food and beverage shipments for 1987.

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Miracle Whip
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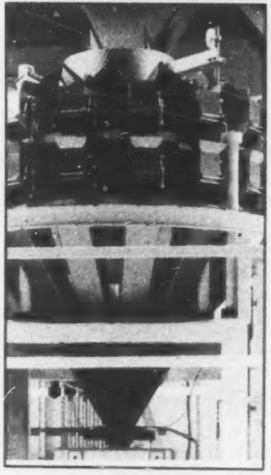


Special Emphasis

SCALES WEIGH-IN WITH ADVANCED CONTROLS AND INTEGRATED FUNCTIONS

Computer controls are boosting the capabilities of weighing systems.

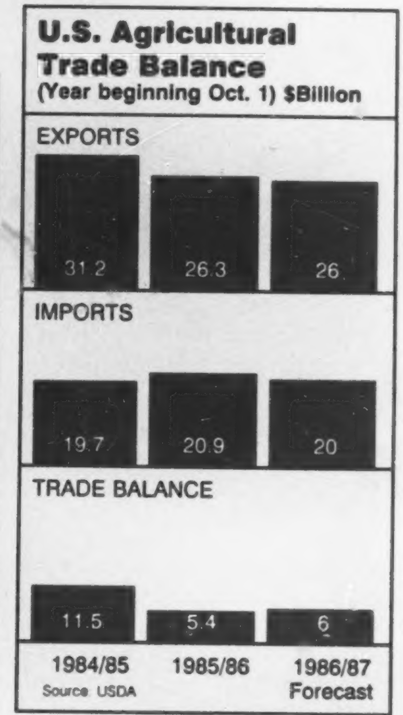
Pages 87 to 90

Domestic food picture bright, exports gloomy for 1987

Wheat	70.6	66	58.5
Rice	4.4	4.4	4.2
Coarse grains[1]	237.7	274.4	250.8
Corn	194.9	225.2	208.9
Soybeans	50.6	57.1	54.7
Soybean meal	22.3	22.6	23.1
Soybean oil	5.2	5.3	5.4
Beef	23726	24187	22646
Pork	14807	14048	13855
Broilers	13762	14366	15263
Turkeys	2942	3311	3646
Eggs	5687.5	5703.5	5780
Milk	140.5	146.3	142.2

Source: USDA

U.S. production will be down because of acreage-reduction programs in response to large global supplies and U.S. carryover stocks. Total meat output will be lower with poultry continuing to grab a larger share.



Agricultural exports will rise in volume but slide in value to record a modest gain in the nation's agricultural trade balance.

Peering into their crystal balls at their respective "Outlook Conferences" held during December in Washington, D.C., both USDA and the Department of Commerce see improving domestic conditions for American farmers and food processors in 1987 and beyond, but the export picture remains gloomy. One basic problem: U.S. exports of both agricultural commodities and processed foods are low in added value.

U.S. agricultural exports will rise in volume but slide in value to record a modest gain in the agricultural trade balance for 1987, said USDA.

According to U.S. Department of Commerce figures, export volume—led by raw grain and cotton shipments—should edge up to about 116.5 million tons from 109.6 million tons in 1986. Value, however, will decline to $26 billion from last year's $26.3 billion. Major reasons for the decline in export value: Record foreign wheat and coarse-grain production, a rebound in foreign soybean harvests and the Soviet Union's best harvest in the past seven years. Lower coffee prices will account for much of the decline in import value.

Ag outlook

Record global output will continue pressure on U.S. crop prices but net farm income will rise perhaps 10 percent due to government price-support programs and low inflation, which will help farmers keep production costs in check. U.S. production will be down because of acreage-reduction programs in response to large global supplies and U.S. carryover stocks.

Domestic demand for U.S. crops will benefit from higher livestock prices but total feed consumption will slip.

Higher cattle and hog prices will benefit livestock producers. Total meat output will be lower with poultry continuing to grab a larger share.

Milk production will drop 3 percent due mainly to the Dairy Termination Program; the decline in the number of cows is offsetting rising yields per cow. Lower feed costs will largely offset lower milk-price supports. But lower milk production combined with rising commercial use should result in "much lower" government purchases of surplus dairy products.

Retail food prices rose 3 percent in 1986 and USDA projects another 2 to 4 percent rise in 1987.

Processed foods outlook

According to Department of Commerce figures released Dec. 30, the value of all food and beverage shipments (SIC 20, in 1982 dollars) will rise about one percent in 1987 after a 1.4 percent gain in 1986 and average annual gains of 1.3 percent 1980-85. Labor, packaging, energy and transportation costs may increase this coming year, but flat or slightly lower commodity prices should keep costs stable for food processors.

Based on the first six months of 1986, total personal consumption expenditures (PCE) for food and beverages at home and in restaurants jumped 4.8 percent in 1986 to $489 billion. Adjusted for price changes, total food/beverage PCE gained 2.1 percent as retail prices rose 3 percent and

(Continued on next page)

(Continued from previous page)

restaurant prices 4 percent. Meat prices – the largest consumer food-expenditure category – rose 2.5 percent; dairy prices, the next largest category, fell 0.5 percent. Canned fruit/vegetable prices fell 1.2 percent but bakery and cereal prices rose 3-5 percent.

According to the Census Bureau, food and beverage processors boosted income on minimal sales gains by cutting operating costs and expenses. Large processors reported a 5.8 percent income gain during the first quarter of 1986 vs. 1985 with only 1 percent sales increase.

Outlook for 1987

Projections for 1987 and beyond continue bright for food processors, according to U.S. Industrial Outlook-1987. Reasons: Increased disposable income; favorable consumer buying trends continued low commodity prices; more 35-55 age-group shoppers; higher after-tax profits resulting from tax reforms enacted in 1986 (with producers of value-added products gaining the most); better access to foreign markets from the General Agreement on Tariffs & Trade talks, where food is a major topic.

As noted last month in *Food Engineering* (Jan., '87), however, the U.S. 1986 agricultural trade surplus of $5.4 billion was offset by a processed-food trade deficit of $5.6 billion, making the U.S. a net importer of food last year. When tobacco and cotton are backed-out of the 1986 agricultural trade surplus, the surplus falls to only $3.4 billion, raising the U.S. net food trade deficit to $2.2 billion for 1986.

The Commerce Department points out that two-thirds of U.S. processed food exports in 1986 were products low in added value, while more than half the imports were high value-added. The same holds true for agricultural exports: USDA forecasts higher volume but lower value in 1987.

U.S. Food Industry Shipments ($ Millions)

SIC		1986[1]	1987[1]
20	TOTAL	307,324	316,681
201	(Meat products)	66,075	67,896
202	(Dairy products)	41,639	42,550
203	(Preserved fruits, vegetables)	36,186	36,346
204	(Grain mill products)	35,078	35,754
205	(Bakery products)	21,064	22,226
206	(Sugar & confections)	18,161	18,695
207	(Fats & oils)	20,977	21,918
208	(Beverages)	42,713	44,123
209	(Misc. foods)[2]	25,434	27,169

[1] Estimated

[2] Seafoods, coffee, pasta, prepared foods not elsewhere covered

Source: U.S. Industrial Outlook - 1987 (U.S. Dept. of Commerce)

The value of all food and beverage shipments (in 1982 dollars) will rise about 1 percent in 1987 after a 1.4 percent gain in 1986 and average gains of 1.3 percent 1980-85.

Trade war with the EEC could affect $billions in trade

Will there be no more Danish ham or French wine or English gin? Will we ship no more meat or grain or fruit to Europe? That's a distinct possibility as tension over a possible trade war with the European Economic Community increases.

The conflict dates from a year ago, when Spain joined the Common Market and had to adopt its blatantly protectionist tariffs on agricultural imports. According to Washington's calculations, the move cost American farmers $400 million a year in grain exports. Unless Europe offsets the loss by easing its barriers to other American products, the Administration proposes punitive tariffs on $400 million of European products sold in the U.S., mainly British gin, French brandy, Dutch cheese, cheap wine from West Germany, and olives from the Mediterranean countries.

Not satisfied with European concessions offered to date, the Administration, as of this writing had set the 200% tariffs to take effect January 31.

The heart of the problem lies in an increasing trade deficit with the EEC. According to the latest U.S. Dept. of Commerce figures, the U.S. balance of trade with the European Community has gone from a plus 18% in 1981 to a minus 34% in 1985. For food products, the numbers reflect a halving of exports and a doubling of imports since 1981. The U.S. points to the protectionist policies of the EEC as the reason for the problem, and with farmers and industry in an uproar, is seeking to remedy the situation.

A trade war would aggravate an already bad trade situation. Even if an agreement is reached in the current dispute, it won't alleviate the overall situation. Farm subsidies on both sides of the Atlantic create huge surpluses that translate directly into curbs on farm imports.

Despite the fall in the dollar, the U.S. trade deficit in 1986 is estimated to have hit an all-time high of more than $170 billion, up from $148.5 billion in 1985. That translates into lost jobs, lost income and threats to the survival of farmers and industries.

In order to achieve the modest 3.2 percent growth for real GNP, forecast by the Administration, the Government is counting on a $30 billion to $40 billion reduction in the trade deficit this year. If that does not materialize, there is risk of recession, higher unemployment and an even deeper budget deficit.

The fracas with the EEC is only the tip of the iceberg. The Administration can not afford to back down, for fear that Congress will react by passing extreme protectionist legislation, which could push the country deeper into a downward spiral. In that case, any company that exports goods or commodities, or imports ingredients or machinery is likely to be affected.

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Winners announced for the first Du Pont Awards competition

Ten new developments representing important breakthroughs from throughout the food industry have been named as winners of the first *Du Pont Awards* competition for food industry innovation. Du Pont Company's Packaging Products Division sponsored the competition in cooperation with the National Food Processors Association. The winners were announced January 27 at the NFPA's annual meeting in Chicago.

According to Wilmer A. Jenkins, director of the Packaging Products Division, "All of the winners are industry firsts and represent significant accomplishments. A number of the developments will change marketing of foods in their product categories. Selected from among an outstanding field of entries, they are the leading edge of change in the food industry."

Competition winners encompass exciting new developments, made possible by the capabilities of plastic packaging, from areas as diverse as grocery retailing, food processing equipment, packaging fabrication, food product formulation and food packaging structures.

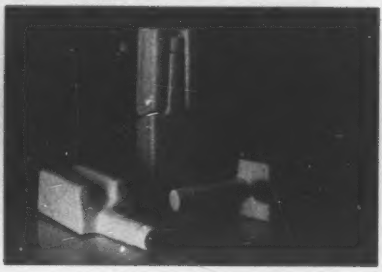
Established to recognize new developments from throughout the the food industry that expand the use of plastics in packaging, the *Du Pont Awards* competition is unique in its scope, being the first such competition to invite participation from throughout the food industry. Entries came from food companies, food retailers, makers of processing or packaging equipment, packaging fabricators and materials suppliers, as well as devel-

Above: FMC Corporation—"Universal Sterilizer."—This sterilizing equipment enables processors to retort products in various plastic container with throughputs competitive with metal and glass, in varying process times and temperatures.

Below: Ocean Spray Cranberries, Inc.—"Flexi-Light, Bell-Shaped Designed Bottles."—Monsanto Co.—"OPET Bottles."—Clear, hermetically-sealed, non-breakable and lightweight,—first hot-fillable plastic container marketed in the U.S.

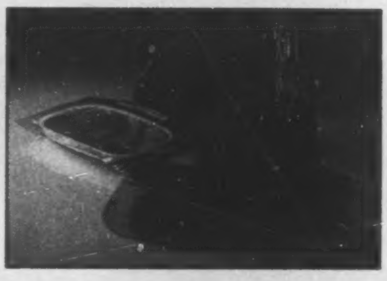
Above: Courtesy Mold and Tool Corp.—"Shear-Pak Tamper Evident Containers."—Providing molded-in tamper evidence in an easy-open, reclosable, easy-dispensing container, the concept is extendable to many types of food products.

Below: Campbell Soup Co.—"Cookbook Classics microwaveable soups."—Continental Can Co.—"Menu Box retortable soup bowls." Reynolds Metals—"Container Mate Closures."— Developed a microwaveable container to market soup.



Above: Universal Symetrics Corp.—"Pac Mate Container Systems."—The twin-pack system capitalizes on the design flexibility of plastics. Interlocking feature encourages multi-unit sales by focusing consumers on multiple purchases.

Below: The Kroger Co.—"Fresh, Fully-Cooked Meats."—Aimed at consumer convenience, Kroger is marketing fresh, restaurant-quality, pre-packaged, fully-cooked meats in the fresh meat case, in a microwaveable package.



opers of new packaging and food marketing concepts.

Judges for the competition included executives from the food and packaging industries, industry suppliers, educators and trade press editors.

Presentations of the awards to the winners by Du Pont Company Vice Chairman Edgar S. Woolard, will be a highlight of the Du Pont Packaging Forum, to be held in New York City, February 24.

According to Du Pont, the *Awards* are designed to encourage and accelerate developments in the food industry that advance the use of plastics in packaging by identifying the most innovative and useful approaches.

Among the eligibility requirements is the stipulation that plastic materials must be an essential component to the final product package. However, entries may involve innovations from other parts of the food industry.

Eligibility is intentionally broad to encourage all involved in the food industry to consider how innovations in their disciplines could make the use of plastics in food processing and packaging possible or more productive.

According to Du Pont, fundamental changes are taking place in food products and their packaging. New options in food preparation methods, container shapes and sizes, and new plastic packaging materials have led to unprecedented levels of new product development and introduction. By the year 2000, Du Pont expects fundamental shifts from metal and glass to high barrier plastics, increasing plastics' share to nearly half of a $44 billion primary food packaging market.

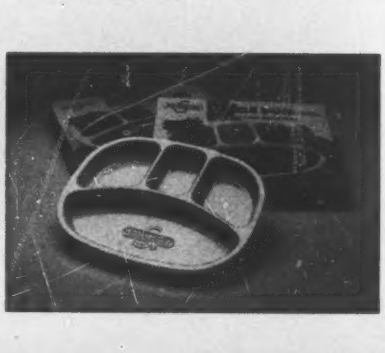
It would appear from the award winners (listed below), that Du Pont has achieved its goal of recognition of varied innovative uses that expand the role of plastics in food packaging.

Above: American Can Co.—"Omni Containers."—Geo. A. Hormel & Co.—"Q-Pak 211 Containers."—The first retortable plastic can to duplicate the functionality of the metal can, these containers incorporate a dessicant with the barrier layer.

Below: Sanford Redmond Inc.—"dispenSRpak single portion dispensing system."—The single-portion package for liquids and viscous food products is easily opened with one hand and permits controlled dispensing of the product.

Above: Culinova Group, (Division of General Foods)—"Culinova refrigerated entrees."—These refrigerated, prepared gourmet entrees utilize modified atmosphere packaging to create a new supermarket category.

Below: Campbell Soup—"Swanson Frozen Dinners."—Signode—"All OvenWare Trays."—Goodyear Tire & Rubber—"Cleartuf Resins."—Controlled crystallization of polyester allows economical production of microwaveable CPET trays.



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Food and beverage shipments to rise 1% in 1987, says Commerce Dept.

Food Industry Shipments
($millions—current)

Industry	1972	1977	1984	1985E	1986E
Meat Products	31,477	46,276	68,579	66,075	67,898
Dairy Products	16,312	26,011	40,402	41,639	42,550
Pres. Fruits & Veg.	11,480	20,333	34,058	36,186	36,348
Grain Mill Products	12,163	22,345	34,377	35,078	35,754
Bakery Products	7,896	12,236	19,387	21,064	22,226
Sugar & Confections	6,622	10,840	17,428	18,161	18,695
Fats & Oils	6,901	14,480	19,551	20,977	21,918
Beverages	13,869	23,329	41,181	42,713	44,123
Miscellaneous	8,335	17,064	25,053	25,434	27,169
Total Food	115,055	192,914	300,016	307,324	316,681

E = Estimate

Food industry shipments have leveled off over the past few years, with an expected rise of only one percent projected by the Department of Commerce for 1987.

Based on 1982 dollars, the Government expects the value of food and beverage shipments to rise by about 1% in 1987, according to figures in the 1987 U.S. Industrial Outlook. This compares with a 1.4% gain in 1986 and 1.3% yearly increases from 1980 through 1985.

The report sees food manufacturers gaining from higher disposable incomes, favorable consumer buying trends and low commodity prices. The report also cites increases in the 35-55 age group that has "highest propensity to spend on food."

The report shows consumer food and beverage spending up 4.8% in 1986. At-home consumption accounted for $328 billion, a 4.1% increase. Restaurant spending was $152 billion, a 6.6% increase. Retail prices for food and beverages consumed at home rose 3%, and at restaurants, 4%. Prices for meat rose 2.5%, bakery/cereal, 3-5%. Dairy prices fell 0.5% and canned fruits/vegetables, 1.2%.

The Commerce Department has taken a positive view of the more than fifty food and beverage mergers since 1984. The report says that acquisitions make this sector of the economy "more concentrated and more efficient." While mergers may reduce the total number of manufacturers, "inter-firm competition still remains keen, to the consumer's benefit," adds the Department.

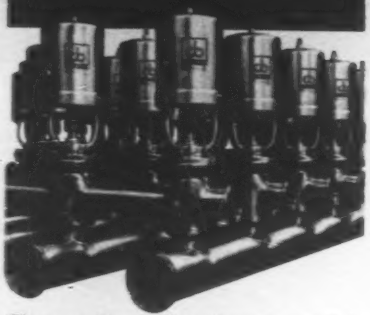
For predictions through 1991, the '87 Industrial Outlook calls for poultry to continue outpacing red meat throughout the period. Most growth in processed fruits and vegetables will come from specialties, with aseptic juices up 50% and frozen entrees up 25%. In the dairy category, Italian cheeses will lead shipments up 0.5% yearly. Baked goods will grow 1.3% per year, as the decline by white bread halts. Breakfast cereals will gain at a 3.3% annual rate with manufacturers aiming to penetrate an older market more effectively.

Pay increases to range 5.25% to 6.25% in '87

That's what nonunionized employees can expect for pay increases in 1987, according to a survey conducted by *Business & Legal Reports*. This is in comparison to 5.5% to 6.4% in 1986, and 6.0% to 7.1% for 1985. According to BLR, the steady downward trend (hopefully) reflects the end of the inflationary '70s.

The results are from BLR's third annual survey of projected pay increases. The company asked employers to provide the percent increase budgeted for merit and general increases, as well as rate range adjustments. The period covered is January through December of the coming year. A total of 698 firms contributed data to the survey. Of these, 29% had less than 100 employees, 43% had 100 to 499 employees, and 28% had over 500 employees.

(Continued on page 27)



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(Continued from page 25)

The survey also showed that union workers can expect a much lower pay increase next year. BLR projects an increase of 4.6% for unionized employees in '87.

Nutri-Cheese Co. goes public

Nutri-Cheese Co., a manufacturer of Feta, Grated Parmesan and Casa Blanca cheese substitutes founded two years ago (*FE* Mar., '86), went public in Oct., 1986, with a $2.6 million over-the-counter stock offering. According to the prospectus, part of the proceeds will be applied to purchase and renovate a 25,000 sq.-ft. building in Oak Park, IL, as the company's new plant.

Nutri-Cheese analog cheese products, available to the ingredient and food-service markets, are based on skim milk and vegetable oils and contain no animal fats, cholesterol or lactose yet taste like the real thing, according to co-founder and CEO Dr. Larry G. Siapantas.

Siapantas, also president of the consulting firm Cheese Foods International (Elk Grove Village, IL), had earlier founded Cheese-Tek Corp., a manufacturer of imitation cheeses sold to Borden in 1979.

FSIS is planning to implement DI

Industry trade association representatives, including Lloyd Hontz of NFPA, have met with FSIS Administrator Donald Houston and members of his staff to discuss current FSIS plans to implement discretionary inspection (DI) in meat and poultry processing establishments as recently authorized by Congress.

According to NFPA, FSIS intends to conduct pilot testing of discretionary inspection as it proceeds to develop regulations. Pilot testing is beginning in the first quarter of 1987 and FSIS expects to publish proposed regulations before the end of 1987.

Greater inspection?

Discretionary inspection permits effective use of inspection resources and does not automatically mean reduced inspection, agency representatives stressed. In fact, many establishments who can not or will not take responsibility for assuring the safety of their operations and compliance with regulatory requirements will find themselves subjected to greater rather than lesser inspection. The goal of DI will be equal assurance of regulatory compliance.

FSIS reported that the pilot program will be started in early 1987 in an undetermined number of plants. FSIS is planning to conduct the pilot programs only in those plants with good processing records. However, it was suggested at the meeting that the results might be more useful if the pilot included a cross section of plants. Experience gained in the pilot test will be factored into the regulations. The goal is to have DI in place nationwide by January, 1988.

SouthPack to debut in Atlanta this May

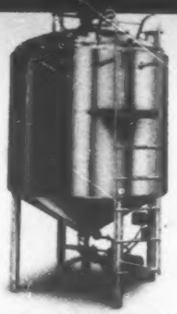
SouthPack, the Southern Packaging Exposition, the first major packaging event to be held in the expanding Southern market will take place at the Georgia World Congress Center in Atlanta, May 13-15, 1987.

More than 200 companies will participate as exhibitors at the exposition, produced by the Cahners Exposition Group. In conjunction with the exposition, the Southeast Region of the Society of Packaging and Handling Engineers will sponsor a two-day professional development conference, May 13 and 14. Conference topics will be directed specifically to the needs of packaging professionals working in the Southeast.

ConAgra to phase out two plant operations

The Carrolton, MO and Fairmont, MN prepared frozen foods processing plants of ConAgra Frozen Foods are scheduled to be shut down this spring. The decision to close was made following a comprehensive internal study of the company's future business, resulting in a reorganization of production with geographic considerations.

ConAgra Frozen Foods officials indicated that these closings will allow the company to maximize the efficiency of its entire operation, including the most recently acquired Del Monte frozen food business, and will strengthen the company's leadership position in the frozen food industry.



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MEETING THE NEEDS OF AN AGING MARKET

Are the growing ranks of the elderly really a new and different market segment, with special needs that must be met, or are they just ordinary consumers with gray hair?

KEVIN J. HANNIGAN
Features Editor

Just as Baby Boomers and Yuppies *were* a hot market, the new "hot" market is the 50-Plus age group. Right now, this fastest-growing of all age segments comprises about 25% of the population but controls nearly 50% of the disposable income.

In the next 15 years, says one recent study, the number of people over 50 will increase by 23% – compared to a 14% increase in the total number of adults in the U.S. population. By the year 2000, 76 million Americans will be 50 or older.

As a group, these oldsters spend about $800 billion each year. And, as a group, their affluence will grow as their numbers increase. The question puzzling many food marketers is how to serve this growing market. Do you develop products aimed at their specific wants and needs, as perceived by market research, or do you concentrate on making today's foods more convenient?

How do you reach this market?

Today, the U.S. marketplace includes the very young, the very old and a massive number of "Mature Adults." In a real sense, the marketplace is representative of the traditional nuclear family. And food firms are marketing to that Family of Man.

Simply put, the food industry does not market to "The Elderly" – at the moment. It develops products to meet common needs and desires of many age groups. But, since there are so many more elderly today, and more coming tomorrow, they must be considered when marketing a new product.

For the past 25 years, food marketers have concentrated on matching the product and the packaging to the market. And, by and large, the elderly in the U.S. are happy with the products now available. The only real complaints have been about the packaging and preparation of the food items, and these concerns also have been met.

With the elderly, problems tend to be more sharply focused. Easy opening takes on greater meaning when you have arthritis, for instance, and lightweight packaging is more appreciated. So is single-serving convenience, which eliminates wasted food and money. Microwave ovens, used to reheat leftovers, are a boon to anyone living alone. They can buy single-serve items at a fast-food shop and freeze for use later.

It's no accident that today's convenience products are available. The food industry as a whole keeps close track of changes in lifestyle and adapts to those changes. As families became smaller, for example, so did package sizes. And, as the number of single-person households increased, food companies developed single-serve packaging.

An example of how closely processors follow the market is the new *Pet-Ritz 6-inch Frozen Pie Shells*. The smaller shell is perfectly suited for 1-2 people. And it's quick to fix, too. Total preparation and baking time for 6-inch pies is usually less than one hour.

That's the story of most new products introduced in the past 25 years. To make products more convenient, easy-open devices and easier-to-dispose materials were brought into play. And heavy glass bottles for milk and juice have been replaced by lightweight plastic, making large sizes easier to carry and reducing the number of trips a consumer has to make to the store.

At retail, many food chains cater to the elderly because they do most of the shopping. In Philadelphia, Acme Markets provides cab service to help oldsters get home with the groceries. Since they don't have to carry the bags or ride a bus, these older customers tend to buy more. And, in Florida, Publix Super Markets provides benches in front of their stores, as well as rest rooms. Publix even tells its clerks to pack two light bags instead of one heavy one. This sort of thoughtfulness brings customers back.

How large is the elderly market?

According to figures provided by BASF Wyandotte's Nutritional Information Bureau, there are about 27 million Americans over 65 years old today; and there will be almost 35 million by the year 2000. Today, there are more than two million aged 85 and older. There will be nearly five million in the year 2000. Also, by the year 2000, there will be nearly 37% more people of retirement age. Yet, the total population will increase by only 18.2%. And the 35-54 age group will increase by about 65%.

The total market will grow, too. By 1990, the U.S. population is predicted to reach 248.3 million. And 31% of that number will be over 45, compared to about 30% in 1980. The median age of the total U.S. population will be 33.2 years. And the median age of just the adults will be 41.6 years.

How do you prepare for this older market? If they have special wants and needs that must be met, what are they? A large number of medical experts say that these needs are related to health and nutrition, and that new products should be developed to help oldsters retain good health. But are these valid reasons to zero in on the elderly?

A matter of taste

As many have suggested, there is considerable interest in the "failing" senses of the elderly—particularly in the sense of taste. It may present a problem in flavoring foods for old people. Thus, FEMA has funded research to find out whether foods intended for the elderly should have intensified flavors. And there are many similar projects going on around the U.S. Much of this research is based on the premise that your taste buds die before you do, probably from overuse. And yet most old people would probably dispute this claim.

It is probably a fact that people older than 50 like stronger flavors than people under 50. It's also a fact that, in the 1950s, food processors decided to make bland foods so that they could market in a wider geographic area. Before that, foods were likely to be flavored to the taste of a particular region. But, when nationwide distribution became desirable, it was discovered that a popular flavor in one region was unliked in another. So, processed foods became bland. And nearly everyone below the age of 40 was raised on these bland foods.

Furthermore, when it comes to tasting food flavors, some older people are superior to their juniors. It takes years to develop a palate for wine tasting, for example, which is why most wine experts are not children. And the older folks are likely to be more discriminating about what they eat. They may like foods that young researchers reject simply because they *can* taste the flavor.

Early taste studies, in which a number of old people were contrasted with a number of young people, may fail as scientific studies on two counts: none of the panelists were trained tasters, and neither could be consid-

(Continued on page 81)

The Boomer Bulge Reaches Middle Age

Age in Years	0-34	35-44	45-54	55-64	65-Plus
U.S. Census 1980	57.9	11.3%	10.1%	9.6%	11.3%
Estimated 1985	55.4	13.3	9.6	9.5	12.2
Projected 1990	52.9	15.0	10.3	8.8	13.1
* and 2000	47.9	16.3	13.8	8.7	9.5
Net Change 1980-1990	-5.0%	+3.7%	+0.2%	-0.8%	+1.8%
* 1980-2000	-10.0%	+5.0%	+3.7%	-0.9%	-1.8%

SOURCE: Chilton Research, U.S. Census Bureau, and *Food Engineering

Both Age and Composition of U.S. Market is Changing

	Total Population	Median Age	White	Black	Other
1980 Census	226,545,805	29.9 Yrs.	83.1%	11.7%	5.2%
Estimated 1985	237,368,566	31.6	82.7	11.9	5.4
Projected 1990	248,311,126	33.2	82.3	12.1	5.6
* and 2000	267,955,000	36.4	81.4	12.5	6.1
Net Change 1980-1990	+9.6%	+3.3 Yrs	-0.8%	+0.4%	+0.4%
* 1980-2000	+18.3%	+6.5 Yrs	-1.7%	+0.8%	+0.9%

SOURCE: Chilton Research, U.S. Census Bureau, and *Food Engineering

Like a bump in the population curve, the Baby Boom Generation both follows and precedes a period of very low birthrate. (TOP)

As the U.S. market grows older, it's also changing in other ways. This shift in complexion also will affect the market.

The ultimate convenience pack, Campbell's Cookbook Classics soup bowl, has been honored as one of the best in the world.

ered a control group. "Maybe kids have lost their sense of taste from eating junk food," cracks an oldtimer, "just like they've lost their hearing from listening to rock music."

Likening the sense of taste to the sense of hearing is probably a mistake. According to the Monell Chemical Senses Center in Philadelphia, a decrease in the total number of taste buds doesn't necessarily indicate a problem with the sensation of taste. That's because you don't use all of your taste buds when you eat, just as you don't use all of your brain cells when thinking. In most people, the decline in the total number of taste buds alone would not justify a special product line for the elderly.

Finally, a dentist points out that most older people wear dentures, which cover the roof of the mouth – and many taste buds – almost completely. That could account for some loss of taste sensation in the elderly.

An "elderly" product line

Older Americans might be healthier if they had product choices, and even an entire food line, that matched their changed dietary needs, suggests a Penn State food scientist. But, before a food line is feasible, research on the differing dietary needs of the elderly must be conducted.

"Unfortunately, very few detailed studies have been carried out on the elderly, and the existing knowledge has been taken from diet recall studies and extrapolated primarily from younger adults," says Dr. Manfred Kroger, a regional communicator for the Institute of Food Technologists. "It is high time that this country paid attention to the wide diversity in the nutritional needs of the elderly," he says, adding that the more than 25 million Americans over 65 are often overlooked in setting nutritional standards.

One stumbling block to developing nutritional standards is that the elderly's requirements are not consistent, explains Kroger. "As a group, the elderly are much less uniform in their health status than are younger persons." Their problems could be related to physiological decline, low economic status, limited food consumption, disease processes and the regimens prescribed to cure or treat illnesses.

However, despite the lack of attention to the needs of the elderly, there are several known guidelines for food for older Americans. "Products should have decreased calories, less fat and more nutrients," Kroger says. Foods should also be easy to prepare by those partially disabled, and the labels should be easy to read.

"Elderly tend to avoid foods that do not have taste appeal or that are difficult to chew," the food scientist adds. "They also tend to eat less as their appetites decline as a result of reduced physical activity, physiological changes, or drug and medication effects." Appropriate portion control by packaging would be the answer. "After all, there are super family sizes," he said.

Besides declines in digestive organ activities needed to extract nutrients from foods, other changes diminish the desire for foods, Kroger says. The senses of taste, smell and vision play an extremely important appetite role in elderly appetites. "The inability of the aging eye to adapt easily from bright light to dim light or to focus clearly can hinder food shopping, selection and meal preparation," he says. And a restaurant does not necessarily offer the solution. Many older persons are reluctant to eat in restaurants because they can't read the menus.

Kroger endorses the idea of a food product line to cater to the nutritional needs of the elderly. "One that satisfied the needs of the elderly would meet the nutritional needs of the whole population," he says. "This entire concept ought to be examined, since our

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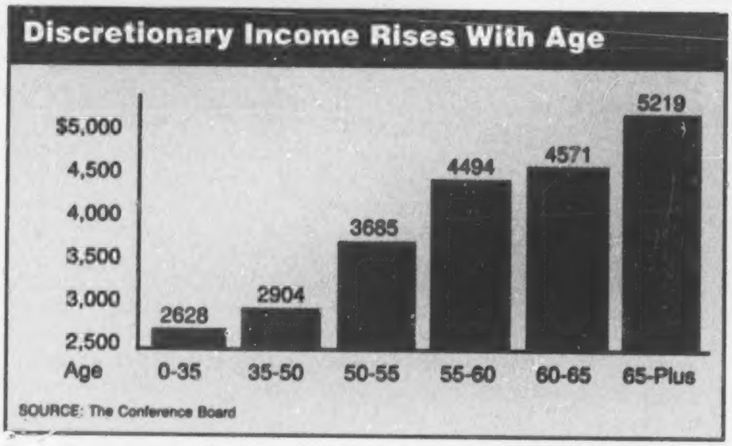

Discretionary Income Rises With Age

SOURCE: The Conference Board

Because older adults tend to be settled in smaller households, which are already paid for, their monthly bills should be less.

Present trends indicate that, in 1990, our larger population will have roughly the same percentages of males and females as today.

Composition by Sex to Remain Stable

	Male	% of Total	Female	% of Total
U.S. Census 1980	110,053,161	48.6%	116,492,644	51.4%
Estimated 1985	115,192,076	48.5	122,175,139	51.5
Projected 1990	120,448,376	48.5	127,861,368	51.5
Net Change 1980-1990	+9.1%	-0.1%	+9.1%	+0.1%

SOURCE: Chilton Research, U.S. Census Bureau

1980-2000—How the Market Can Change in One Generation

Age Group	Change 1980-2000
Total Population	+18.2%
0-34	-1.9
35-44	+70.6
45-54	+62.8
55-64	+9.5
65-Plus	+36.7

SOURCE: The Conference Board

As the Baby Boomers reach middle age, the number of "Mature Adults" in the marketplace will increase by two-thirds.

Today, as a group, older people spend about $800 billion annually for goods and services. That will increase as their numbers grow.

most pronounced demographic trend is toward a larger elderly population."

What is aging, anyway?

Aging is that process in the human experience beyond maturation in which the body begins to fail. It is a physical experience, and not a mental one. By contrast, "getting old" is a state of mind. Most older people feel younger than they are. For that reason, nobody buys foods developed for old people, not even old people. Typically, older consumers have strong brand preferences.

Concern for the health of these older citizens is natural. And nutrition is a key factor in maintaining health. But can physical problems be treated by dietary means? Do elderly persons have special nutritional needs and, if so, what are they?

Altering food products to meet the nutritional needs of the elderly is unlikely because we don't know what those needs are. According to Dr. Myron Winick, M.D., editor of Columbia University's *Nutrition and Health*, "Today, there is not a single nutrient for which there is a recommended dietary allowance (RDA) for men and women 65 and older. Worse, there's no data base on which to formulate recommendations."

Scientists in nutrition and gerontology are working hard to fill this information gap. At Tufts University, for instance, the USDA has established the Human Nutrition Research Center on Aging. Among the center's many projects is a survey of more than a thousand people ranging in age from 60 to over 100 years. These people are relatively healthy and free from disease, with some 300 of them living in nursing homes. As study volunteers, they supply information on what they eat and what nutrition

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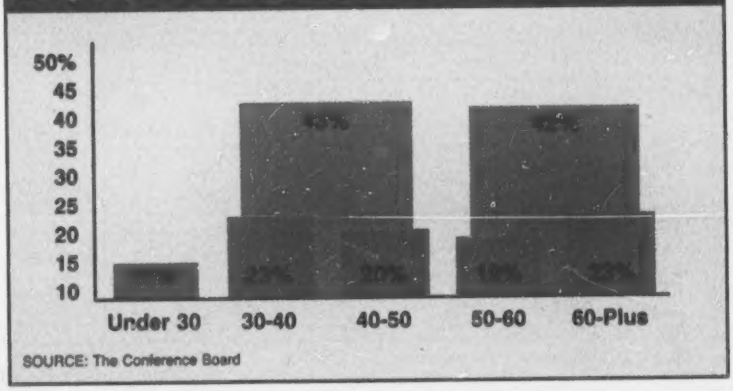
Disposable Income, Distribution by Age



SOURCE: The Conference Board

A Moving "Bump" in the Population Curve

Every marketer's dream is a clearly defined target market that is very large and has money to spend. Through most of the past 20 years, that was the "Baby Boomers." Most recently known as "Yuppies," the "Boomer" demographic bulge has been the darling of the marketing world for over a generation.

This moving "bump" in the population curve represents both a normal birth rate for the 1945-57 period and those births which had been postponed by the Depression and World War II. Births during this period rose sharply in 1945 and began to decline in 1957. Until recently, that decline had continued. Now, however, it appears that the birth rate may rise again to approach a "normal" level.

Because of the lower-than-normal birthrate before and after the "Population Explosion," the segment aged 35-54 years now represents nearly 25% of the total U.S. population. More importantly, since it is a clearly defined group, it divides the total marketplace into three well-defined segments—the Youth, Mature and Elderly markets.

Most new food products and packages introduced during the past 20 years have been aimed at this large, central market segment. There was a surge in baby foods and "kid" products through the 1960s, and an emphasis on teenagers and young adults in the 1970s. Now, to keep up with these "Mature Adults," fast-food chains have become restaurants and frozen dinners have become gourmet meals.

Today's marketing strategy is to serve the total market, while still keeping in mind the special needs of the three basic segments. Of course, the "Mature Adult" segment will continue to be the focal point for advertising and product development. And today that segment has entered its middle years, suggesting that there will soon be a greater interest in developing foods for the elderly.

This segment has proven that it is willing to try something new, pay for quality, and desires greater convenience. Most importantly, the group that falls roughly between the ages of 25 and 60 does most of the shopping.

Insert 44 on Inquiry Card →

supplements they take, and they're carefully examined for nutrient deficiencies.

What has been learned so far? "As people get older," says Robert B. McGandy, M.D., a professor of nutrition associated with the center, "they need fewer and fewer calories. Of course, as calories are reduced, so are all the other nutrients. So, by younger people's standards, all of the nutrients are lower. We're not seeing real deficiency conditions, such as scurvy and beriberi. But, in many cases, nutrient intakes would fall in the range of borderline or suboptimal."

"In view of lowered caloric intake with its lowered nutrient levels, and possibility of decreased absorption," says Dr. McGandy, "an RDA-level vitamin and/or mineral supplement would put even the lowest-calorie diet well into the range of nutrient adequacy. Assuming, of course, that today's RDA standards are appropriate for the elderly."

There is a basic problem, however. "All we know about nutrition and chronic diseases, and anything we know about cancer, has been derived mainly from studies of middle-aged people. So, who knows how important these factors are for the elderly?"

Supporting this view, a report from the Human Nutrition Center on Aging in Boston indicates that most older Americans take good care of themselves despite their waning appetites. A survey of nearly 700 healthy Boston-area residents over 60 showed that their blood levels of essential vitamins and minerals were within normal ranges, although they consumed 200 to 400 fewer calories a day than middle-aged people. The adequate nutritional levels were due to wise dietary choices and the use of vitamin/mineral supplements by 50% of those surveyed. The Boston study is the first to establish norms for healthy middle-class people throughout the aging process.

Dr. McGandy favors a curbing of zeal in prescribing preventive or restrictive diets for the very old, especially those in nursing homes. "Where food is probably the last happy thing left in life, to be put on a low-sodium or low-fat and -cholesterol diet, or a diabetic diet, really just about takes away all that's left. And putting restrictions on somebody who barely eats anything at all isn't reasonable. One has to take up the social, psychological and emotional factors."

The consensus of all researchers, therefore, seems to be that the elderly deserve food products that they can enjoy – not "hospital" food to solve a medical need. A careful choice of food products now available, plus vitamin and mineral supplements, should be enough to keep the older members of the population happy and healthy.

The food industry in the past 50 years has performed a major miracle in upgrading the health of the entire U.S. population. In part, it was accomplished by fortifying food products with vitamins and minerals. And a major part was educating the public to the importance of a balanced diet. Given the diverse views of food and medical researchers, it appears that the industry should continue to do what it has done so well in the past.

Elderly consumers must be considered, of course, but as a part of the larger market – not as a "problem" group. The solution may be to form a taste panel of elderly people, to give an opinion on the tastes of certain foods. This trained panel could give some indication of the loss of taste sensations overall and in the different parts of the mouth, since each type of taste is expressed in a different oral area. In this way, the needs of the elderly could be met without segmenting them as a "Geriatric" market.

Though the total population will swell, and women will still have a slight edge in longevity, neither sex will control the market.

Age/Population Distribution by Sex

	Census 1980	Estimated 1985	Projected 1990
Male			
0-34	60%	[illegible]	[illegible]
35-54	21.4	[illegible]	[illegible]
55-Plus	[illegible]	[illegible]	[illegible]
Female			
0-34	[illegible]	[illegible]	[illegible]
35-54	[illegible]	[illegible]	[illegible]
55-Plus	[illegible]	[illegible]	[illegible]
Total Population			
0-34	[illegible]	[illegible]	[illegible]
35-54	21.4	[illegible]	[illegible]
55-Plus	[illegible]	[illegible]	[illegible]

SOURCE: Chilton Research, U.S. Census Bureau

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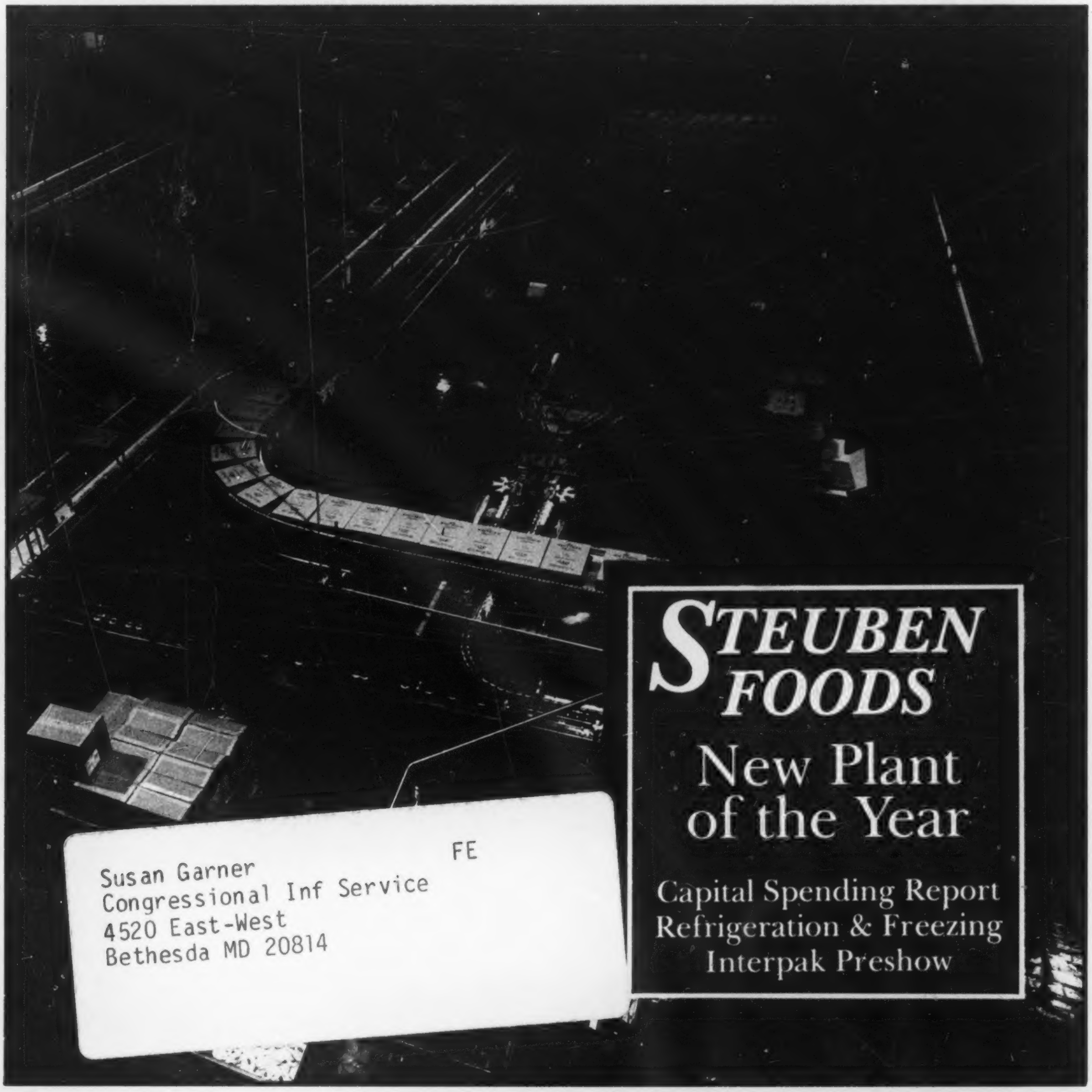

STEUBEN FOODS

New Plant of the Year

Capital Spending Report
Refrigeration & Freezing
Interpak Preshow

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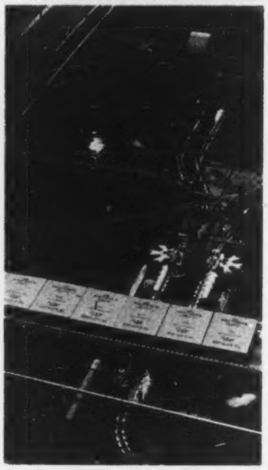
FOOD ENGINEERING



COVER STORY

Steuben Foods, a high-tech yogurt plant and anchor of the planned "agribusiness" center of Western New York, is *Food Engineering's* choice for this year's new plant of the year.

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This month's Report features news from the NFPA conference discussions on low-acid, refrigerated, extended shelf life products and their growing market; why playing politics is crucial for the food industry; the U.S./U.S.S.R. Trade Council; and why keeping up with technology is necessary for the competitive food processor.

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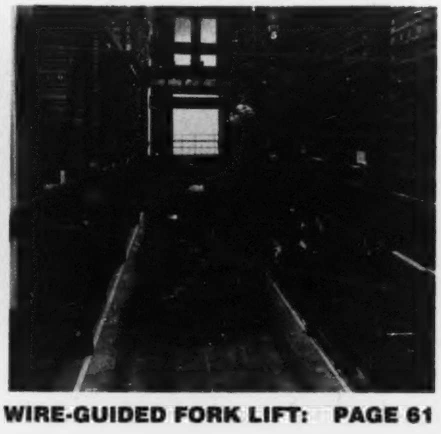

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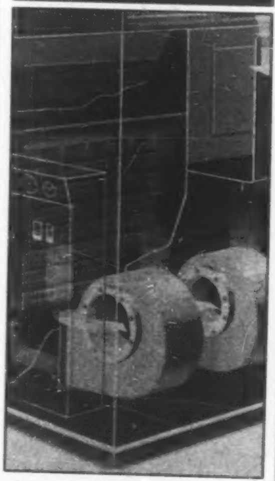

Special Emphasis

REFRIGERATION AND FREEZING GAIN NEW EMPHASIS

Refrigerated foods are riding the crest of a consumer trend that views fresh as the key to better nutrition and taste.

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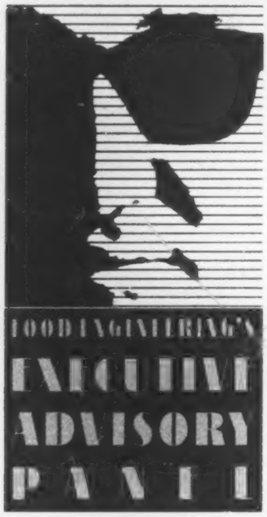
CAPITAL SPENDING '87

EQUIPMENT BUYERS' SURVEY

Our measure for the coming year of the budgets, preferences, schedules, and attitudes that drive the people who make the technology buying decisions in the food industry. Where does your company stand?



This year's Executive Advisory Panel Equipment Buyers' Survey drew 315 usable responses from a Panel mailing of 640, and we generated 154 pages of tables. The members of the Panel have been individually selected to be able to provide us with information that is representative by size of company, segment of industry, and category of decision maker. It is through this representative sample of expert opinion that we can get results that we feel mirror actual market conditions. And we thank the Panel for its continuing support.

In 1986, the headline for our Equipment Buyers' Survey (see the January '86 issue) reported that "We're Going For It." Well, this year it looks like the momentum is still there. Overall, for example, 67.9 percent of our Panel projected production increases at their locations for 1987.

There was even more optimism when the respondents were asked to look at their companies as a whole: 85.7 percent saw company productivity as making some gain. A substantial part of those people saw gains over 10 percent to be the rule: 30.5 percent of the respondents discussing their individual locations, and 33 percent of those discussing their companies.

It is necessary, perhaps, to temper the enthusiasm of some of our respondents with the fact that realistically the food industry overall in 1987 will probably not show much more than a 3 percent rise in shipments. Still, the survey shows a great many people looking forward to major growth in their businesses, and obviously committed to making it happen. As we have seen in 1986 with the rapid growth of categories that a couple of years ago hardly existed, like shelf stable low acid refrigerated takeout foods, the companies that take advantage of opportunity are nowhere near exhausting their capabilities or slowing down because of what may look to be mature segments.

In looking at the numbers by company size, it is the smallest companies that are most positive about large increases. Over 35 percent of them feel they are looking at more than 10 percent increases in production, while only about 21 percent of the largest companies surveyed felt the same way. This is not unusual, since smaller companies start from a smaller base in tallying up their percentage increases. Also, if the smaller company is well run, it is more flexible than a large one in being able to take advantage of market opportunities.

CHARLES J. HABERSTROH
Editor-in-Chief

What they'll spend

You can't go for big increases without pressing more capital into service; and according to our Panel, spending will continue in 1987 much as it did in 1986, with two exceptions at opposite ends of the spectrum. The percentage of respondents who indicate that their company will spend under $100K on equipment went from 11 percent last year to 17.4 percent this year. Redressing the balance somewhat on the other end, 48.6 percent of the respondents said their companies would spend over $1M, compared to 44 percent last year (in fact, 28.6 percent of the respondents indicated their companies would purchase in excess of $5M worth of equipment).

And as one of the accompanying charts shows, the percentage of companies throwing big dollars against production improvement rises dramatically as the size of the company goes up. Only 10.1 percent of the survey respondents who worked for companies with fewer than 100 employees projected purchases in excess of $5M. But 58.1 percent of those in companies with 500 or more employees felt they were looking at equipment bills of over $5M this year.

The top spenders by segment – the highest concentrations of companies spending $1M or more – were the meat people (55.7 percent), the dairy folks (55.4), canned products producers (58.6), and producers of fats and oils (57.1). Considering how the meat segment is reviving itself, how dairy products are proliferating as the industry looks for more value-added niches, and the aggressiveness of canned products people like Del Monte, these numbers for these segments are not surprising.

Where the priorities lie

The high activity that will be going on in equipment purchasing will be going on, in general, in those technologies that cut across industry segment. For this reason, the highest across-the-board purchase priorities were given to sanitation equipment (rated 2.23 out of 3.0 on a company-wide need basis). Next came process instrumentation (at 2.19), filling equipment (at 2.05), valves and fittings (1.99), pumps (1.97), and on-line QC (1.94).

These priorities, of course, varied by industry segment. For example, 33.3 percent of the frozen food segment respondents felt machine vision was a high priority item for them in 1987, as did 29.3 percent of the beverage people; but only 21.3 percent of the cereal segment felt the same way. On the other hand, it was the cereal people who felt the most pressing need for improved instrumentation and process control, with 41 percent voting it a high priority, while only 28.2 percent of the frozen food segment felt that way, and 34.7 percent of the beverage segment.

Still, it was a bit surprising that instrumentation was not a higher priority than it was, and that on-line QC, a hot area for product development, rated after valves and pumps. It is hard to say whether this is because companies are becoming used to those technologies; because not enough companies are still fully aware of what these technologies can do; or because a great deal of the equipment being produced already has the instrumentation (at least the PC instrumentation) capabilities built in.

What makes them buy?

We asked respondents to rate purchase influences on a scale of one to four. We

(Continued on page 76)

Reading our numbers

Charts have been written to read across from left to right, with the items in the left-hand column as the base of comparison. For example, the chart on this page showing Production Projections, 1987, By Company Size indicates that of those respondents in companies of under 100 employees, 1.0 percent projected more than a 10 percent decrease in production.

Production Projections, 1987, By Company Size

Projections are for company-wide production increases/decreases compared to 1986.

Under 100 employees	1.0%	0.0	1.0	11.1	3.0	23.2	35.4
100-499	0.8	0.8	3.1	7.1	17.3	23.6	33.1
500+	4.7	2.3	1.2	9.3	18.6	25.6	20.9

**Percentages may not add up to 100% because of multiple responses or partial responses.

Source: Food Engineering Equipment Buyers' Survey

Production Projections, 1987, By Segment

Projections are for company-wide production increases/decreases compared to 1986.

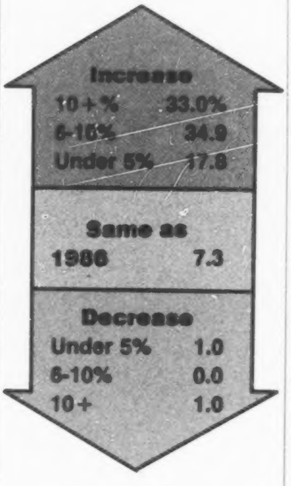
Meat	0.0	0.0	1.3	11.4	13.9	27.8	41.8
Bakery	1.2	0.0	0.0	6.1	17.1	31.7	37.8
Dairy	0.0	0.0	1.0	6.9	18.8	28.7	38.6
Flavors/ ingredients	0.0	0.0	0.0	7.4	13.2	36.8	41.2
Canned products	0.0	0.0	0.0	6.9	17.2	37.9	36.2
Fats/oils	0.0	0.0	0.0	10.2	16.3	51.0	20.4
Frozen products	0.0	0.0	2.6	7.7	17.9	30.8	35.9
Confectionery	0.0	0.0	0.0	5.6	20.4	42.6	31.5
Cereals/ grain	1.6	0.0	0.0	6.6	23.0	44.3	23.0
Beverages	0.0	0.0	0.0	8.0	24.0	38.7	25.3
Other	2.2	0.0	0.0	4.3	19.4	32.3	35.5

**Percentages may not add up to 100% because of multiple responses or partial responses.

Source: Food Engineering Equipment Buyers' Survey

Production Projections, 1987

Projections are for overall company-wide production increases/decreases compared to 1986.

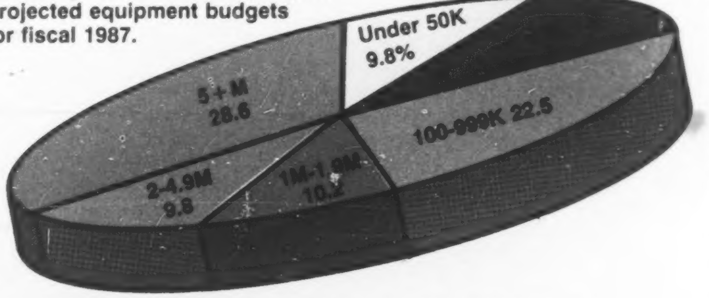


**Percentages may not add up to 100% because of multiple responses or partial responses.

Source: Food Engineering Equipment Buyers' Survey

Budgeting, 1987

Dollar figures reflect company-wide projected equipment budgets for fiscal 1987.



**Percentages may not add up to 100% because of multiple responses or partial responses.
Source: Food Engineering Equipment Buyers' Survey

Budgeting, 1987, By Company Size

Dollar figures reflect company-wide projected equipment budgets for fiscal 1987.

	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Under 100 employees	27.3%	14.1	21.2	6.1	7.1	10.1
100-499	2.4	6.3	33.9	12.8	11.8	22.8
500+	1.2	2.3	8.1	10.5	10.5	58.1

**Percentages may not add up to 100% because of multiple responses or partial responses.
Source: Food Engineering Equipment Buyers' Survey

Budgeting, 1987, By Segment

Dollar figures reflect company-wide equipment budgets for fiscal 1987.

	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Meat	10.1	8.9	17.7	15.2	8.9	31.6
Bakery	13.4	13.4	15.9	7.3	3.7	31.7
Dairy	7.9	10.9	16.8	6.9	11.9	36.6
Flavors/ Ingredients	14.7	13.2	22.1	8.8	10.3	25.0
Canned products	3.4	13.8	19.0	8.6	10.3	39.7
Fats/oils	16.3	8.2	14.3	6.1	16.3	34.7
Frozen products	12.8	12.8	15.4	5.1	5.1	38.5
Confectionery	7.4	9.3	25.9	7.4	9.3	35.2
Cereals/ grain	13.1	8.2	16.4	6.6	8.2	37.7
Beverages	10.7	12.0	14.7	5.3	6.7	37.3
Other	8.6	9.7	23.7	9.7	15.1	21.5

**Percentages may not add up to 100% because of multiple responses or partial responses.
Source: Food Engineering Equipment Buyers' Survey

wanted to find out not just where their priorities lay, but to get a better fix on what makes them buy one piece of hardware rather than another.

The heavy hitting factors, in order of strength, were service by supplier, payback period, training by supplier, supplier reputation, fast line changeover capability, and price. All of these, with the exception of price (which only came in sixth), involve a food manufacturer's perception of the support available from the supplier, and the productivity of the machinery. The likelihood of this changing in the near future, particularly with increased competition, is practically nil. In fact, as time goes on, manufacturers will be more and more concerned with the level of service provided by equipment suppliers.

The purchasing clock

One of the survey's most dramatic examples of the flexibility of the small and midsize company had to do with how fast, from start to finish, it took to get new equipment in, up, and running. In general, small and mid-sized manufacturers were about 30 percent faster than their large counterparts when it came to getting in custom machinery, and more than 25 percent quicker with stock items that perhaps needed only a few minor modifications.

By far the largest block of time is that spent from the time an agreement is reached with a supplier to the time the equipment is delivered. The least chunk of time is the in-plant shakedown of the equipment and the training that goes along with it. Still, this can vary anywhere from about a month and a half to two and a half months depending on the type of equipment and the size of the operation it is going into. The same is true for the time it takes for setting the performance specs. The preliminary meetings, on the other hand, can take anywhere from two to almost five months, while locating a supplier and reviewing equipment is another two to three months. All in all, it will take a minimum of seven months and up to a maximum of almost 15 months to get it done.

What this shows also is that while a small company can react more quickly, not even a small company can be turned on its heel to abruptly exploit a new market if that opportunity involves an equipment purchase. And if a large company is going to move into a new technology to improve its productivity, it might be two years before any evidence of a change will show because it could

(Continued on page 78)

take them a year and a quarter just to get the technology in place. This is why two things are important, particularly for a large company--strategic planning, and the decentralization of operating units.

What makes it go?

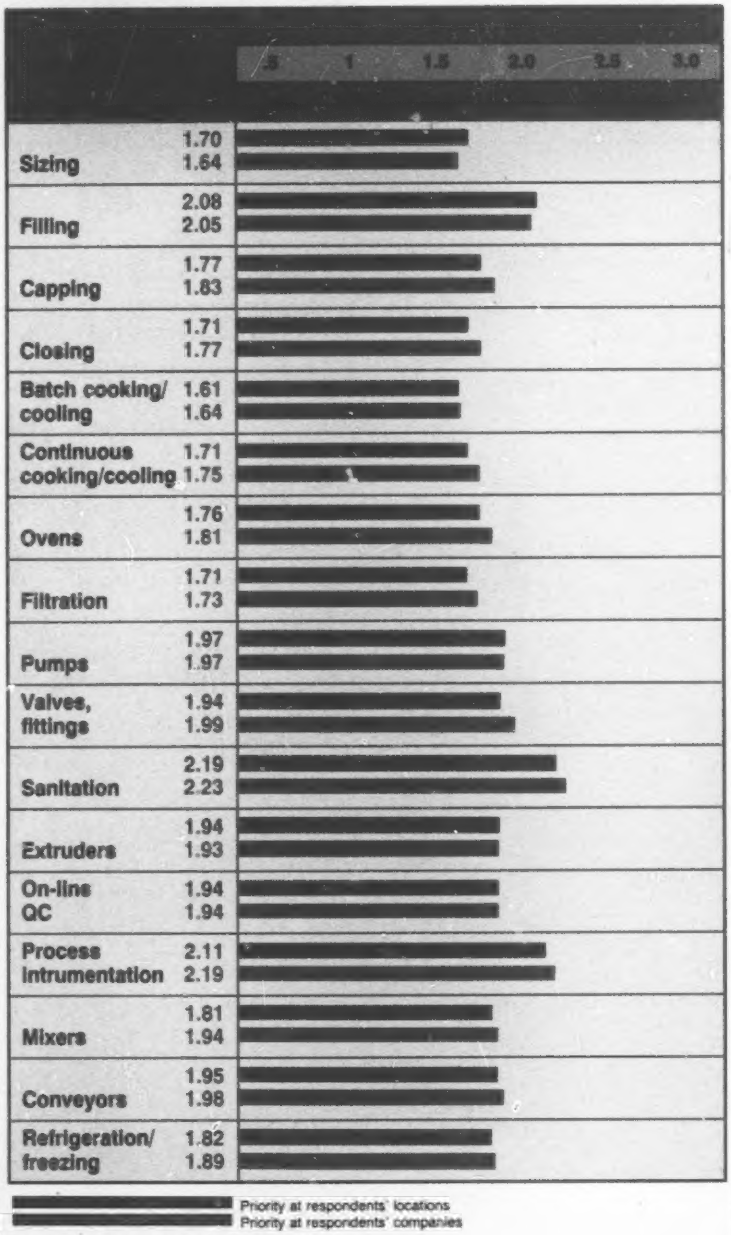
The last major block of information we wanted to put some measure to was the matter of the forces within a company that drive the decision for replacing or upgrading capital equipment. We asked each of the major departments that might have a hand in the process to rate various factors.

This is a situation where the average answers are misleading. On the average, the levels of importance assigned to the four factors we asked about were very close on a scale of one to three: Need for new products (2.69), engineering's mandate to improve productivity (2.35), the need for increased capacity because of expansion of markets (2.36), and health and safety concerns (2.40).

Where you begin to see significant differences is when you start to look at how many people considered each of those factors major. It is here that the numbers related to the marketing and new product sectors of the companies begin to stand out. This is where we get that curious dichotomy in the decision-making process: Even though marketing does not make machinery specifying decisions, it is an enormous motive force in why things happen. For example, 63.2 percent of the respondents felt that the needs of marketing were a major factor in why things happen at food companies in the equipment purchasing areas. In fact, interestingly, more of the engineering people (70.7 percent) saw it that way than market-

Purchase Priority, 1987

Figures represent where on the priority scale people using the equipment below placed the buying of that equipment. Figures are for both their location, and company-wide.



Source: Food Engineering Equipment Buyers' Survey

Motive Forces

The figures indicate the ways in which respondents rated the factors below according to their perceived importance in bringing about a change in technology or in manufacturing procedure.

The marketing need for new products	3.8%	19.4	63.2
Engineering need to improve productivity	6.7	43.2	36.8
Need for increased capacity for new markets	9.5	36.2	40.6
Health & safety concerns	5.1	42.2	39.4

**Percentages may not add up to 100% because of multiple responses or partial responses.
Source: Food Engineering Equipment Buyers' Survey

Factors Influencing Purchases

Numbers indicate the average influence rating each group of decision makers gave the factors below.

Case studies in the media	2.19	2.15	2.18	2.26	2.17	2.27	2.12	2.18
Supplier catalogs, lit	2.30	2.30	2.22	2.34	2.38	2.29	2.23	2.24
Payback period	3.32	3.32	3.46	3.37	3.53	3.31	3.36	3.27
Fast line changeovers	3.05	3.15	3.07	3.19	3.15	3.09	3.25	3.00
Parts interchangeability	2.48	2.45	2.44	2.61	2.51	2.44	2.42	2.51
Modularity (quick teardown, service)	2.98	2.99	3.00	3.03	3.04	2.96	3.04	3.11
Lease/buy option	1.98	2.06	1.92	2.08	1.76	2.11	1.90	2.11
Process control adaptability	2.46	2.58	2.65	2.54	2.73	2.51	2.55	2.31
Supplier reputation	3.18	3.20	3.22	3.27	3.27	3.23	3.24	3.18
Price	3.12	3.25	3.22	3.24	3.08	3.21	3.18	3.18
Service by supplier	3.46	3.45	3.49	3.51	3.50	3.45	3.55	3.33
Training by supplier	3.19	3.17	3.16	3.19	3.14	3.21	3.26	3.16
Past experience with equipment	2.71	2.86	2.74	2.76	2.77	2.77	2.74	2.67

[illegible] Important 2 Somewhat important 3 Important but not critical 4 Critical

Source: Food Engineering Equipment Buyers' Survey

ing people (52.5 percent). In large companies the impact of marketing on the manufacturing mindset was greatest, with 81.4 percent of respondents from companies with 500 or more employees saying that marketing was a major factor.

As far as the number of respondents that felt engineering's mandate to improve productivity was a major factor, the response was about half (36.8 percent) of what it was for marketing needs. The need for increased capacity to open new geographical markets came in at 40.6 percent; and health and safety concerns came in at 39.4 percent.

And so, 1987 will be one to watch. There will be no abatement in the competitive rigors that pushed the market through '86; and those rigors will mean companies keeping their technology in tune, and in fact having to predict where the next technological move will be (see our Industry Report story on p.13 about coping with what one executive calls the technology "discontinuity gap"). Equipment and technology are the doors to the future. When the future comes, which side of the doors will you be on?

Equipment Purchase Time Frames

Figures represent average number of months for each stage of the purchasing decision process. Figures also represent time frames for custom-produced versus stock equipment.

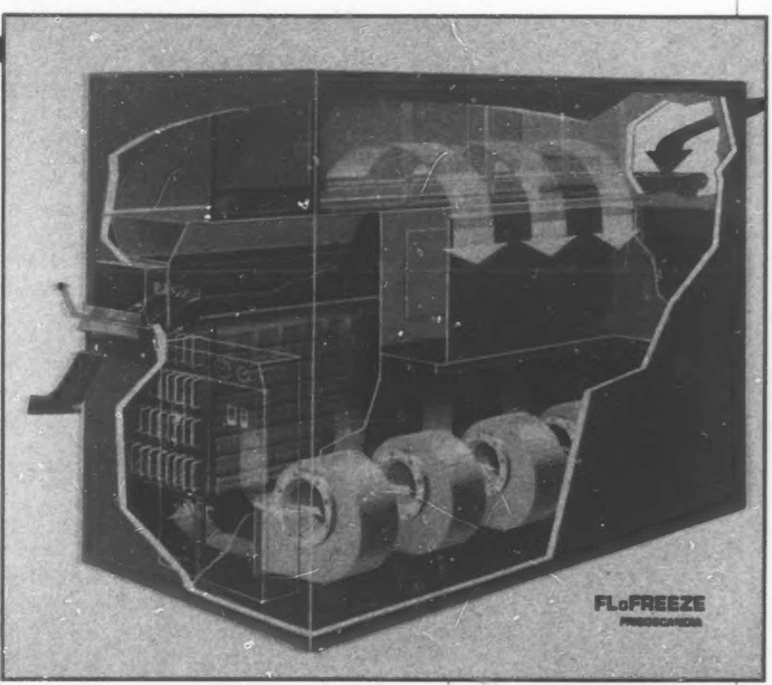
Preliminary meetings	3.75 1.92	3.48 2.13	4.82 2.79
Setting performance specs	2.43 1.56	2.42 1.83	2.41 1.58
Locating suppliers, pricing, reviewing equipment	2.64 1.89	2.96 2.18	3.11 1.77
Time from agreement to delivery	3.81 2.40	4.66 3.25	6.15 3.64
In-plant shakedown and training	1.91 1.63	2.38 1.73	2.41 1.57
Total time	11.29 7.14	11.89 7.82	14.81 9.03

▬ Custom-produced equipment
▬ Stock equipment (with minor modifications)

Source: Food Engineering Equipment Buyers' Survey

REFRIGERATION & FREEZING GAIN NEW EMPHASIS

In the midst of a convenience- and freshness-driven market, producers are turning more and more to frozen and refrigerated foods, and more efficient refrigeration and freezing systems.



Frigoscandia features a fluidizing IQF system which distributes air through a specially perforated stainless steel tray in the freezing zone. The bed of upward-blown polar air supports, transports and individually freezes each particle in the product flow.

Are we still in the middle of a frozen food boom? According to figures from *Quick Frozen Foods International,* the boom has been flattening out, with only a 2.9 percent increase in tonnage from 1984 to 1985. More surprisingly, prepared foods, supposedly the focal point of new frozen products, had only a one percent growth rate.

On the other hand, according to the Food Institute and information released by SAMI, frozen and refrigerated foods are enjoying a surge in popularity. The refrigerated aisle is a particularly "hot" section, because consumers are willing to pay for increased convenience. Additionally, refrigerated foods are riding the crest of a consumer trend that views fresh as the key to better nutrition and taste appeal. Many manufacturers are entering the refrigerated foods field, e.g. Campbell with refrigerated soups and sauces, and Pillsbury with Azteca brand refrigerated Mexican foods. Overall, the refrigerated foods department reported increased tonnage of 12.5 percent in the latest 12-week reporting period, ending October 10, 1986. Refrigerated orange juice led the category with an increase of 30 percent, reflecting the convenience trend.

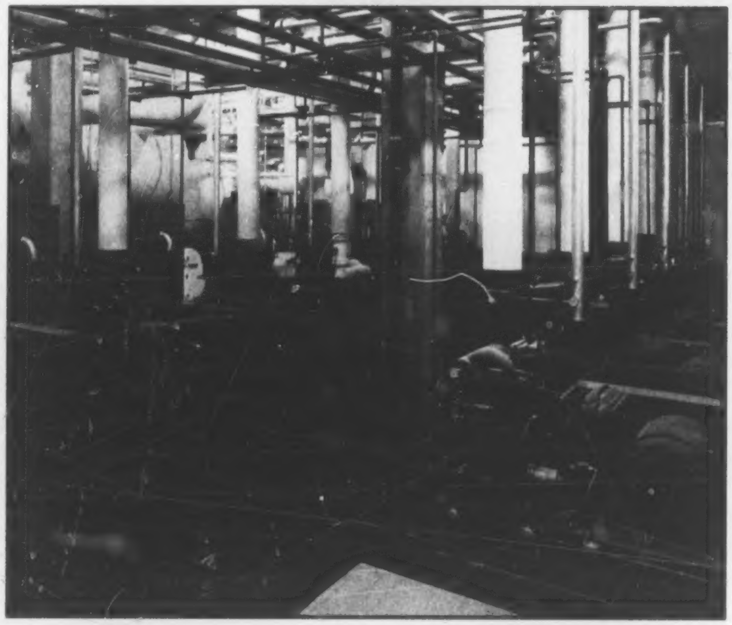
It would appear from the figures that there is a lot of activity within an overall steadily growing category. With freshness and convenience driving the market, there seems to be a shift towards items requiring less preparation time. Dual-ovenable trays and smaller sizes have become a market staple. And refrigerated, rather than frozen entrees are appearing.

BILL DRENNAN
Senior Editor

Changes in equipment

According to George Briley, of Refrigeration Engineering Co., one improvement in the refrigeration field has been screw compressors. New compressors are becoming increasingly versatile and energy efficient. Recently a microprocessor-controlled variable volume screw compressor has been introduced. The unit senses the discharge pressure and suction pressure and adjusts the compressor to its optimum point. This

(Continued on page 86)



This refrigeration engine room contains reciprocating ammonia compressors from APV Crepaco. The units feature lightweight aluminum pistons and connecting rods and can provide a 5 to 15% energy savings.

saves energy by optimizing the energy input to the compressor. The energy savings can be as high as $10,000 per year.

Another development that has occurred recently is bearing improvements. Cylindrical roller bearings are provided to handle the radial loads with the thrust loads absorbed by angular contact ball bearings. In addition, balance pistons are provided to reduce the thrust load and lengthen the life expectancy of the bearings. The design-rated bearing life of the antifriction bearings is in excess of 100,000 hours. This bearing system reduces frictional losses and has superior rotor positioning capabilities, thus reducing power consumption, particularly at higher pressure ratios.

Briley says to look for smaller units in the 10 hp to 125 hp range coming soon with excellent efficiencies (possibly even better than reciprocating compressors). And, new rotor profiles will assure better efficiencies for larger screw compressors.

Vilter Manufacturing Corp. has introduced a versatile reciprocating compressor, capable of handling a wide range of applications. Its design allows it to be used with virtually any industrial refrigerant at compression ratios of up to 8:1 with ammonia and up to 14:1 with some halocarbons.

Joe Briede of Alamo Refrigeration says that refrigeration engineering companies are becoming more and more involved in the processing cycle. "For instance," says Briede, "the almost endless variety of convenience foods created over recent years need to be properly accommodated in the selection of freezing or cooling equipment." Alamo features freezing tunnels with adjustable retention times for different types of products or packages.

IQF units

Interest is very high in individual quick freezing units that are incorporated into a processing line. Vegetables and meats, in many instances are first frozen, then packaged. There is a booming market for Mexican, Central and South American vegetables. This so-called "stoop vegetable" business is a boon to the economies of these Latin American countries. The vegetables are harvested, then individually quick frozen, and shipped to markets in the States. A number of U.S. companies have established plants in these countries to take advantage of an almost year-round growing season. IQF freezers are also used for such items as chicken parts and finger foods.

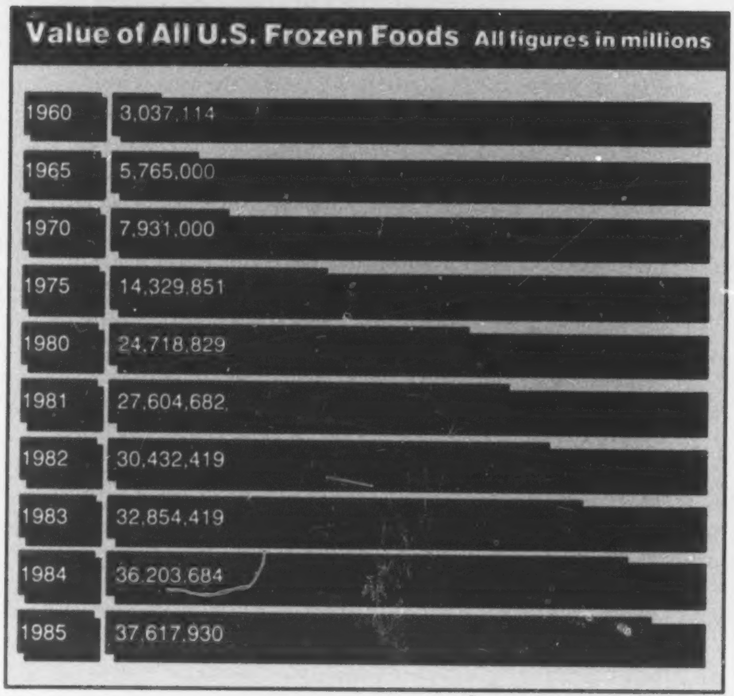
IQF freezers are designed for odd-shaped products, products that are to be frozen individually, and continuous processes. Product is taken by conveyor through a freezing compartment. The more dwell time that is required, the longer the conveyor that is

(Continued on page 89)

1985 Estimated U.S. Poundage; Tonnage and Value For All Frozen Foods by Category All figures in Millions

	Poundage			Kilograms			$ Value		
	Retail	Instit'l	Total	Retail	Instit'l	Total	Retail	Instit'l	Total
Prepared Foods	4,277	1,601	5,878	1,940	726	2,666	$8,540	$2,501	$11,041
Fish & Seafood	589	1,496	2,085	267	679	946	2,257	8,405	10,662
Vegetables	2,057	5,874	7,931	922	2,665	3,598	1,885	3,380	5,265
Juices & Drinks	1,562	1,281	2,843	709	581	1,290	2,116	1,315	3,431
Poultry	2,182	1,231	3,413	990	558	1,548	2,404	1,253	3,657
Meat	517	1,016	1,533	234	461	695	838	2,208	2,866
Fruits	71	750	821	32	340	372	83	613	696
Total	11,255	13,249	24,504	5,105	6,010	11,115	$18,123	$19,495	$37,618

Source: Quick Frozen Foods Int'l



Source: Quick Frozen Foods Int'l

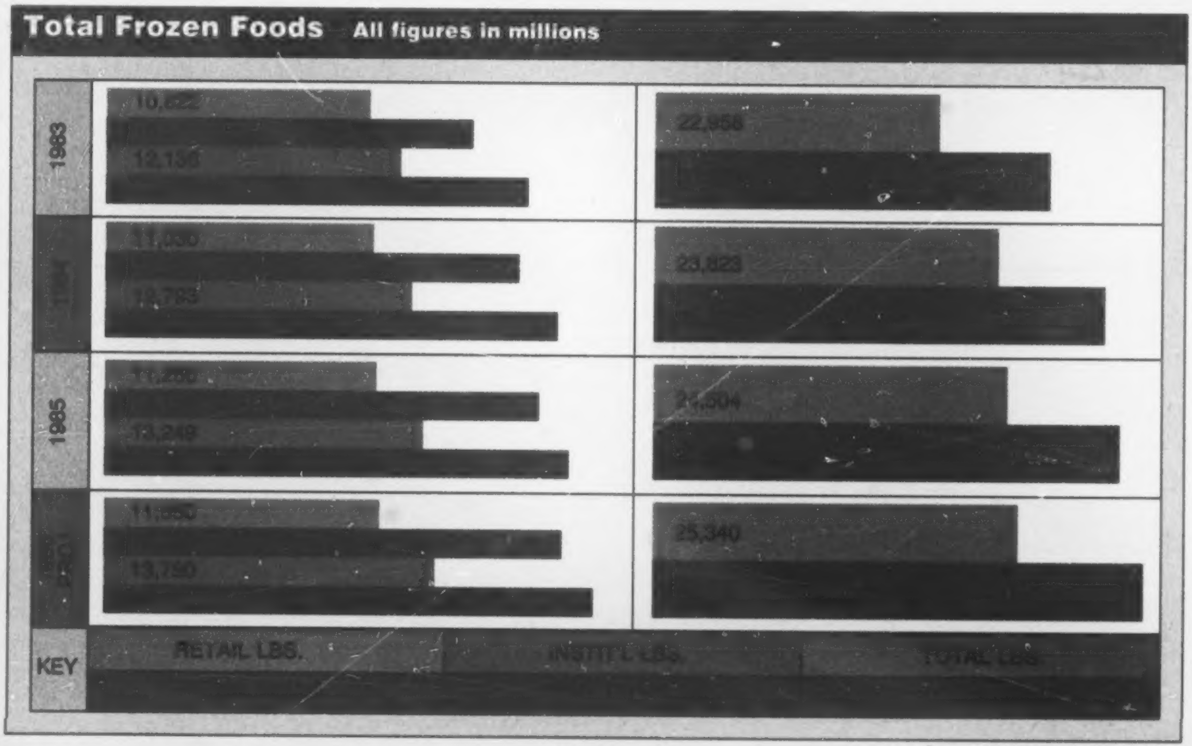
used. For items that require longer dwell times, spiral freezers are often used. These consist of a spiral conveyor inside the freezing compartment, which ensures proper dwell time without taking up a lot of space.

Refrigeration Engineering Corp. has introduced a *Dual Air* spiral freezer which is a combination of both vertical and horizontal air flows arranged in a counter flow configuration (product movement is counter to the air flow). According to the manufacturer, the system provides greater yield through less dehydration and greater economy of operation through more efficient use of the refrigerated air. Less air must be moved to do the work, requiring less fan horsepower. The system is capable of self-adjusting from horizontal to vertical air flow when product loading so dictates.

Frigoscandia's *GYRoCOMPACT* spiral freezers feature a self stacking belt which functions as a complete, self-contained freezing zone. The base-driven belt forms a closed tube through which the air flows down through the stack, minimizing freezing time and making it impossible for even lightweight or round products to be blown off the belt. Another feature of the Frigoscandia line is their semi-prefabricated modular assembly which means the freezer can be up and running in ten working days.

Freezing Systems, Inc. has a flow-through individual quick freezing tunnel that uses two belts to carry product through the freezer. On the first belt, refrigerated air blows up through the product and condi-

(Continued on page 90)



Source: Quick Frozen Foods Int'l

tions it for deep bed fluidizing. Final freezing takes place on the second belt. Individual control of belt speeds allows the unit to handle a variety of products.

Other systems

Contact plate freezers work well with flat packages where the plates achieve maximum contact with the product. Product packages are loaded in tiers, with the contact plates between the tiers. The refrigerant flows through the plates allowing rapid freezing of the product. The fast freezing helps maintain desired product characteristics such as texture and flavor. Crepaco and Frigoscandia, among others offer continuous plate freezing systems.

Under development by Refrigeration Engineering Co., are brine spray freezers for use with shell-on shrimp and other products. This provides much fresher looking product without the expense of removing the shells. With this method, the result is individually frozen shrimp.

Liquid Carbonic and Liquid Air Corp., both feature liquid nitrogen tunnel freezers. Liquid Carbonic features a straight line configuration with either under-the-belt cooling or combined top and bottom cooling for IQF applications. Liquid Air has introduced a tunnel that operates at -300° F, which they say reduces liquid nitrogen consumption by 20%.

An extension of the IQF idea has been presented by Frigoscandia. Individually frozen pellets bring the same kind of handling convenience to liquid and semi-liquid products as IQF does to solids. Product is frozen quickly by direct contact between two stainless steel belts in a continuous moving sandwich. The top belt in the line is flat and the lower belt, corrugated with flexible seals on both sides.

Product is applied to the corrugated belt by a spreading device, after which the flat belt is brought in contact with the product, thus totally enclosing it. Freezing time is 2½ to 5 minutes, depending on the type of product. The frozen product leaves the two belts in form of a "corrugated mat." The mat is sawed in 40mm wide strips which subsequently are split in the corrugations. The technique has been applied to meatslurry, liquid egg, vegetable puree, fruit pulps, dairy products and sauces. Any pumpable product is a candidate for pellet freezing.

Pre-chilling is an efficient way of improving freezer productivity. Garroutte's Waterfall Hydro-Chiller uses a three-stage process with a final chilling 33°F water cas-

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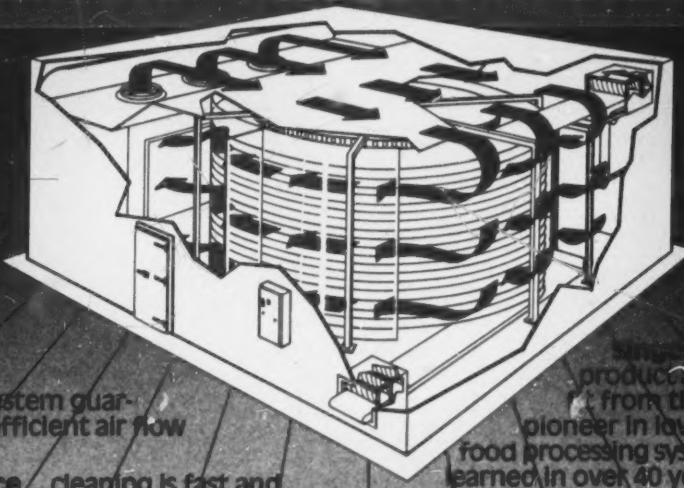

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Portability and modularity have become desired equipment traits so that equipment acquires a resale or trade-in value. This Cascade freezer from Refrigeration Engineering is completely assembled and ready-to-ship.

cade. According to Garroutte, freezing units can then do more product per hour with one-third the refrigeration horsepower.

Selecting a freezer

There are more costs involved in the freezing process than just the price of the freezer. The cost of freezing, energy costs, manpower, maintenance, downtime, and product dehydration are all very important items to be considered in freezer selection.

Other questions to be asked are: Is the unit compact or will it require a whole new building? Is it easy to operate? Does its design offer room for capacity expansion or will a second or replacement unit be required? Is it mobile? Is there a modular or plug-in design that offers resale value? Does it provide the best yield? Is the value of the product enhanced by freezing in this unit? If these questions are not included in cost calculations, there could be a rude awakening down the line.

Whatever the system used, whatever the product, processors are gearing to a market-driven, rather than a production-driven position to achieve success.

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Sweeteners
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FOOD ENGINEERING

COVER STORY

Food Engineering's annual new products analysis found that the driving forces behind the 1986 introductions were freshness, healthfulness, convenience and excitement.

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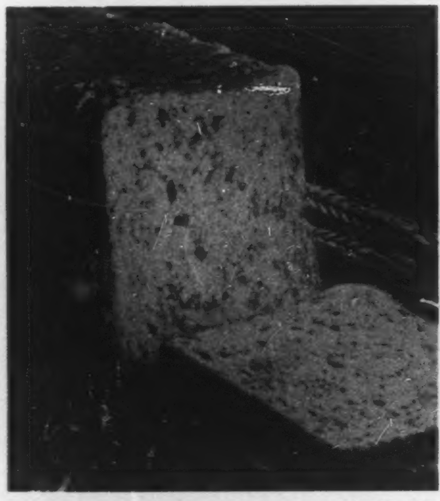

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SWEETENERS: SUGAR UNDER FIRE

New developments in corn sweeteners and aspartame are attacking sugar on two fronts: cost and diet. And a host of new sweeteners are waiting in the wings for FDA approval.

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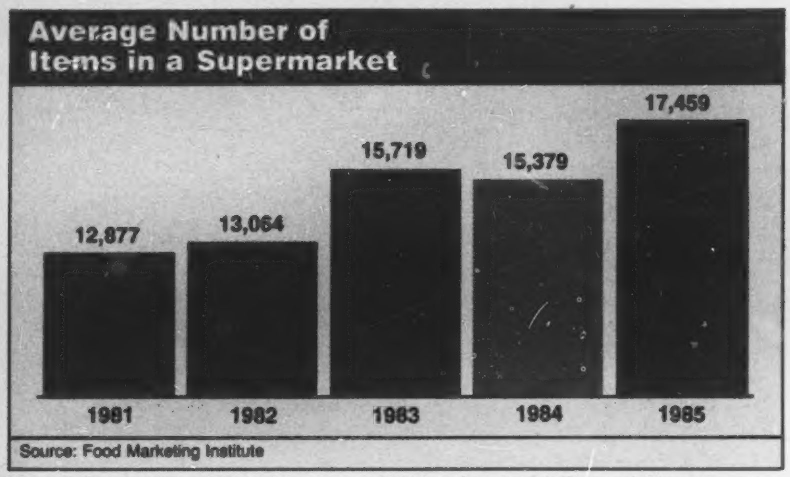
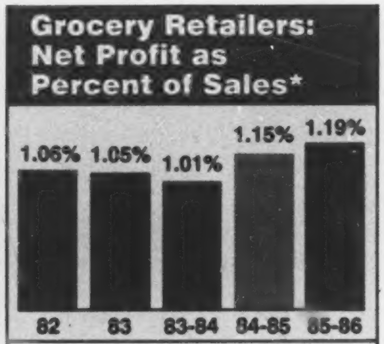
Improving your odds in the fight for shelf space



Source: Food Marketing Institute

Though the number of items in supermarkets has increased, the mortality rate among products fighting for shelf space hasn't. On the average, over 55% of all new food items presented to grocery retailers never even make it onto the shelf.



*Methodology was revised in 1983-84 to collect figures on other lines of business besides grocery sales for supermarket companies.
Source: Financial Review, Food Marketing Institute

Competition is the name of the grocery game—a condition causing more and more products to be pushed off the shelf.

Marketing a new product to today's fickle consumer is difficult. But marketing products to grocery retailers is just as hard. Understanding the supermarket business, and what retailers want, are key to making the most of your new product.

Supermarkets are becoming more competitive and more sophisticated—a trend that is causing a higher product turnaround than ever before.

Supermarkets, which average profits only slightly higher than one cent on each consumer's dollar, have lately adopted measures which have changed how they evaluate incoming new products:

- Direct Product Profitability—a system that measures each item's actual profit contribution to the retailer—is becoming more popular as a management tool. Though recognized for over twenty years, computerization has made this formula for determining profitability more efficient and more accurate.

"It begins with a product's adjusted gross margin to reflect such factors as deals and allowances, and it identifies and measures costs that are directly attributable to the product: labor, space, inventory and transportation," explains the Food Marketing Institute. "It helps determine the most profitable product mix and effects of promotions and advertising."

- Grocery retailers, have also instituted more efficient market research systems, allowing them to respond to consumer desires—and withdraw products once they're on the shelves—faster than ever before. Over 12,861 supermarkets nationally are using UPC scanning devices—a no-mistake system of measuring what sells, and what doesn't. "Supermarkets can now respond fast to changing consumer tastes," says the Food Marketing Institute, "and UPC and scanning devices help them track performance of each individual food product."

With more sophistication in the marketplace, the success rate for new products entering the marketplace should be good. Ironically, though, the majority of new food products never even make it to the grocery shelf. The major grocery retailers agree that, on the average, over 55 percent of all products presented to their buyers are turned down before even reaching the shelf.

In the twelve months of 1985, Stop & Shop's Grocery Buying Staff evaluated 2,429 grocery products, frozen foods and dairy items—of which 1,385, or 57 percent, were turned down because they did not meet this retailer's "criteria for authorization"—and 1,044, or 43 percent, were purchased. One year later, the firm reports, 40 percent of the accepted items were discontinued due to lack of movement, and a further analysis showed that of the 2,429 items presented in 1985, only 632 or 26 percent are still on the shelves today.

Getting in the door

And though retailers' criteria for accepting new products varies from product to product, the three national grocery retailers interviewed by *FE* said they look for the following characteristics:

- *Promotional Support*. "We want national advertising exposure, couponing, and the security of a national brand name," says a Publix representative. "This is how we are relatively assured of having good sale potential with a new item." The representative says that placing a nationally-backed, branded item on the shelf is much "more realistic" than placing on the shelf an "item no one has ever heard of."

At a recent National Food Processors Association conference, Stop & Shop's Vice President of Grocery and General Merchandise Sales and Procurement Richard Ponte suggested that more processors and retailers work together to both develop and

(Continued on next page)

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(Continued from previous page)

market products. "At Stop & Shop," he said, "we distribute 3.5-million circulars per week with a vast array of weekly specials. Our TV advertising offers an opportunity to place new products prominently in our commercials, and in-store sampling provides an opportunity to expose customers to these products at point of sale."

- *Quality, Convenience, Value!* "While this may sound simplistic, new products which truly have all of these attributes are not as common as you may think," said Stop & Shop's Ponte. Ponte used Stouffer's Lean Cuisine as an example of what this retailer looks for in a new product. The frozen entree took ten years to develop because, according to Stouffer President David Jennings, the numbers took a back seat to the "real issue:" taste.

The successful introduction of Lean Cuisine, said Ponte, not only created a category of low-calorie, high-quality meals with broad-based appeal, but, for the first time, offered frozen food as a positive, convenient alternative. And though the dinners are not inexpensive, says Ponte, the items offer value to the consumer because they save preparation time.

- *Expandable categories.* The most difficult areas in which to find shelf space, says a Safeway spokesman, are those "non-expandable" places in the supermarket, such as frozen food and dairy cases. "Our frozen food area has increased in item count from 500 to 1,000 in the last five years," he says, "and it's a real tough area to squeeze new items into."
- *Market Conditions.* One other major retailer stresses the importance of timing: "The competitive situation, existing market shares and number of items in that market, as well as future projections based on our own marketing research, determine which products we will accept and which products we won't."

Retailers differ in their methods of measuring market potential, and all declined to be specific about how they authorize food products. But all suggest that food firms contact retailers individually, in the early stages of new product development. When processors familiarize themselves with retailers' specific "product-approval criteria" for their market, says Ponte, that processor improves his chances for product success. Working together from the start, they agree, can help insure shelf space for tomorrow.

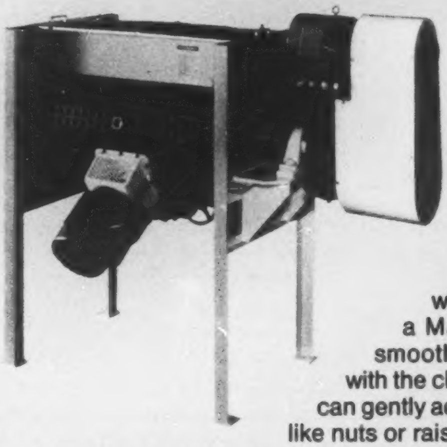
Store Formats Type and Number in U.S.

Conventional	21,890
Combination	850
Convenience	45,400
Super Store	4,400
Economy*	3,365

*includes limited assortment, warehouse & super warehouse & hypermarket
Source: Progressive Grocer, Annual Report, 1985

The number of convenience stores is rising—dictating a more convenience-oriented product mix on store shelves.

GET AGGRESSIVE AND GENTLE MIXING WITH ONE MARION MIXER



Marion paddle mixers can quickly produce blends of uniform color and texture, or gently mix fragile products like coffee beans, leafy herbs or fruited yogurt. In fact, you can do both with the same machine.

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A new type of barrier is forming for Plastic Packaging

Environmental concerns over the disposal of plastic wastes could deal the progress of plastic packaging a harsh blow.

Plastics are projected to be the packaging material of the future. However, there is growing concern over the disposal of plastic waste. According to the NFPA, four bills have already been introduced in the new Congress dealing with the disposal of plastic wastes on land and into the marine environment. This federal attention reflects a growing interest at the state level about minimizing the environmental impact of plastics.

At the DuPont Packaging Forum recently held in New York, four speakers addressed the issue of plastic waste disposal.

Assemblyman Arthur R. Albohn, of the New Jersey State Legislature stated that New Jersey is about to put the nation's first mandatory source separation and recycling legislation into effect. Municipalities of the state will be required to choose three materials from a broad list for recycling.

The law contains a provision requiring plastic beverage containers to be removed from the waste stream for recycling at the same rate as the lesser rate of either glass or aluminum beverage containers.

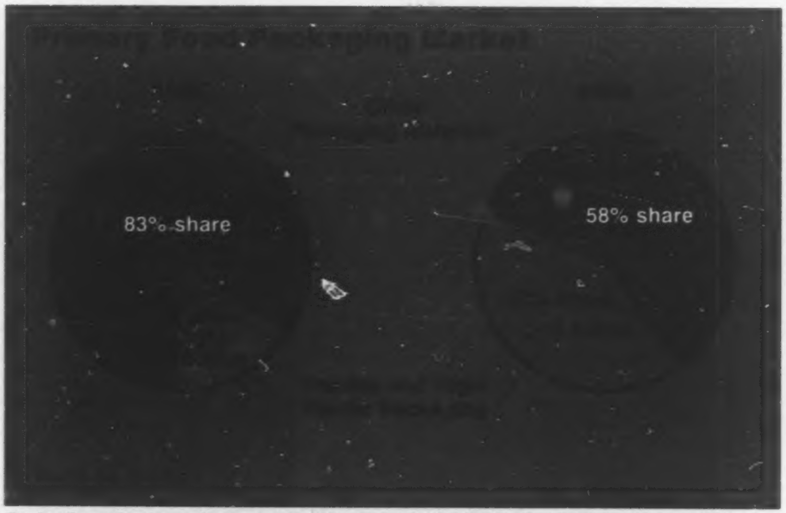
Dr. Melvin Druin, vice president of packaging for Campbell Container Co., a subsidiary of Campbell Soup, said that the consumer demand for convenience has resulted in the development of new microwaveable food products and has created a demand for new plastic packaging. Druin states that Campbell sees plastic packaging, "not as a replacement to existing materials, but as a means to providing broader packaging options and choices beyond metal, glass and paper to meet our consumer needs."

Druin said that a combination of recycling, resource recovery and land filling is necessary to create an environmentally sound approach to the solid waste problem.

Charles O'Connell, president of the Society of the Plastics Industry (SPI), said that the plastics industry is trying to educate legislators, regulators and environmentalists that ad hoc attempts to deal with a complex societal problem by banning certain plastics is only a Band-Aid approach to the solid waste question. The SPI is trying to help answer questions about using incineration and recycling as primary disposal methods. O'Connell says that through the SPI, the industry is participating in a series of full-scale incinerator tests to address emissions concerns. O'Connell stated that the plastics industry was the impetus for the Plastics Recycling Foundation.

Joe Bowers, Jr., manager, packaging products for Coca-Cola USA, limited his comments to PET soft drink containers. According to Bowers, the soft drink industry supports voluntary PET recycling as an answer to the disposal problem.

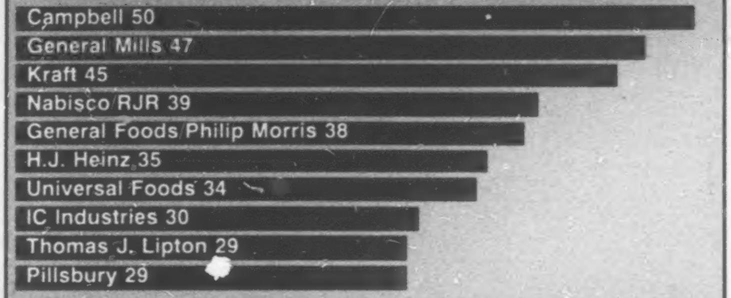
From the concern of the participants in the forum, one thing is clear. If long term waste disposal answers are not found, there is a chance that plastics, as a form of packaging could be legislated out of existence.



Projections for huge increases of the use of plastics in food packaging could be reversed, unless the concerns for the disposal of plastic wastes are answered.

NEW PRODUCTS ANALYSIS

Top Ten Manufacturers for 1986*



*All totals include divisions/subsidiaries

Source: Marketing Intelligence Services

Food Companies with 5 or More Introductions in 1986

41	Kraft
41	General Mills
32	Campbell Soup
31	Liberty/Ramsey Imports
30	Nabisco Brands
28	Pet
25	General Foods
24	Pillsbury
21	Thomas J. Lipton
18	Frito-Lay
17	R.T. French
16	Borden
13	Weight Watchers International
13	Reese Finer Foods
13	Beatrice
12	Quaker Oats
12	Procter & Gamble
11	Ralston Purina
10	Pepperidge Farm
10	Kellogg
10	Health Valley Foods
10	H.J. Heinz
10	Geo. A. Hormel
9	Hain Pure Food
9	Continental Mills
8	Specialty Grain
8	McKee Baking
8	General Biscuits of America
8	Durkee Famous Foods
7	Warner-Lambert
7	Stouffer Foods
7	Ore-Ida Foods
7	National Sea Products
7	McCormick
7	Keebler
7	H.P. Hood
7	Entenmann's
7	Carnation
7	Arnold Foods
6	Sunshine Biscuits
6	Southern Traditions
6	Sable and Rosenfeld Foods
6	Mother's Food Products
6	Michigan Fruit Canners
6	M&M Mars
6	Kenston Kitchens
6	Hershey Foods
6	Gourmands
6	Doxsee Food
6	Bahlsen of America
5	Topps Chewing Gum
5	Sunfresh
5	Snacktime
5	Schwartauer Werke
5	Progresso Quality Foods
5	Popsicle Industries
5	Original Trenton Cracker, The
5	Nalaley's Fine Foods
5	Mrs. Paul's Kitchens
5	Little Bear Organic Foods
5	Legume
5	Lawry's Foods
5	Interbake Foods
5	Hershey Chocolate
5	Goya Foods
5	Gourmet Foods
5	Gourmet Confections
5	French Cuisine
5	Ferrara Foods & Confections
5	Del Monte
5	Celestial Farms
5	Best Foods

Source: Marketing Intelligence Services

Explains Ernest Townsend of General Host, "Most frozen food manufacturers have forgotten that every product has a value relationship – consumers are willing to pay for quality, but they're not willing to overpay for it."

Despite the astounding number of new foods introduced in 1986 and the seemingly conflicting trends, the driving forces behind many of them can be summerized in four words – fresh, healthy, convenient, and exciting. Americans are more health conscious than a decade ago, but they won't give up quality and they do believe in rewarding themselves.

Food Engineering has identified eight areas of new product introductions. Each of these areas is a result of meeting consumers' needs and is fueled by one or more or the driving forces mentioned above. The categories are: "Lite" or "Less of"; Gourmet; Fresh; Breakfast Foods; Foods with Tofu; Convenient Foods; Ethnic; and Fruit Enhanced Foods. These categories are obviously interconnected. For example, health concerns are responsible for more people turning to fruit-enhanced products, but a desire for more exciting foods is leading to the introduction of foods containing more exotic fruits such as kiwi and passion fruit.

Some new food products can fall in several of these categories. One example is Tyson's new line of International frozen entrees. They offer the convenience of microwave oven preparation; they all contain chicken, and chicken is perceived as a "healthy" source of protein; and the international cuisine theme offers excitement. Filling so many consumer desires, it's not surprising that this line is doing extremely well.

The future

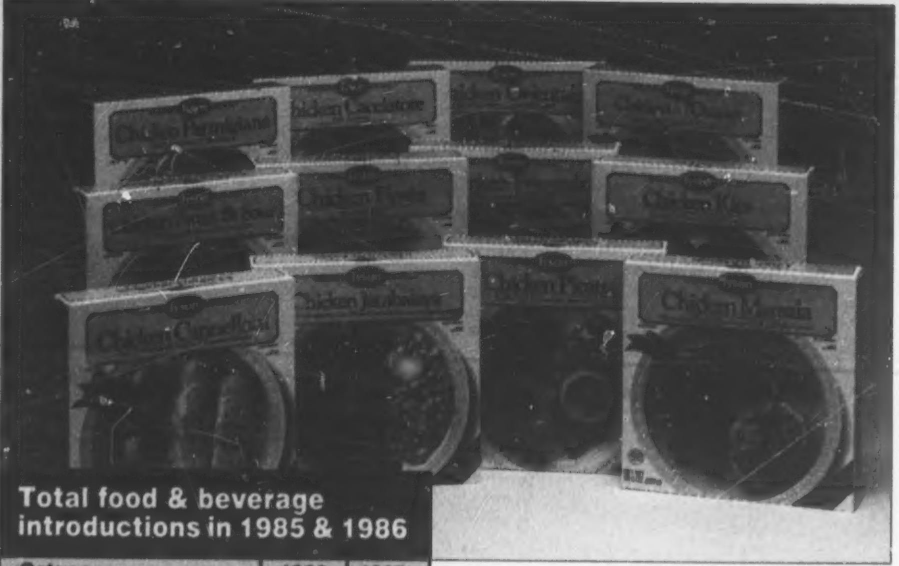
The major reason for food processors to examine new product introductions from a previous year is to identify hot areas for future new product introductions. General Foods' President and CEO, Philip Smith, told *Advertising Age* that he believes health-oriented products will remain on the rise and that low-cholesterol and low-fat products will be the fastest-growing areas. He added that fiber will continue to be important, but things like calcium will come and go.

Other areas where new products activity is likely to be active are:

•Carbonated dairy beverages.

•New ethnic foods – such as American Indian or Vietnamese.

•Improved fresh foods.



The broad consumers appeal of Tyson's line of International Frozen Entrees made it one of the most successful new products introduced in 1986.

Total food & beverage introductions in 1985 & 1986

Category	1986	1985
Non-alcoholic beverages	408	343
Snacks	276	227
Confectionery	217	186
Alcoholic beverages	199	177
Sauces & gravies	183	128
Bread & bakery	181	121
Cookies & crackers	175	136
Dairy products	172	126
Ice cream & frozen conf.	121	102
Salad dressings & dips	121	85
Frozen meals	114	99
Staples & seasonings	106	91
Frozen meats, poultry & fish	93	65
Meat, fish, poultry	86	125
Fruits & vegetables	79	92
Pasta & rice	79	66
Condiments	78	60
Meals & meal mixes	74	47
Cereals	71	60
Misc. foods	68	52
Pet foods	67	9
Soups	59	48
Jams, jellies, sweet spreads	58	28
Sweet toppings & syrups	54	33
Frozen other	43	77
Frozen fruits & vegetables	42	32
Frozen breads & bakery	37	30
Mixes & frostings	30	47
Savoury & nut spreads	28	12
Desserts	21	29
Alcoholic substitute bev.	15	17
Diet Foods	13	24
Frozen beverages	13	9
Baby foods	6	5
TOTAL	3,389	2,872

Source: Marketing Intelligence Service

•Breakfast soups (a popular category in Europe).

•Foods with more low- or unsaturated oils – this will occur as more becomes known about how saturation levels of oil effect our health.

•Upscale condiments – especially other than mustards since this area is becoming saturated.

•And even more convenience-engineered foods.

Fruit-Enhanced

America's most popular dessert is fruit – including fruit salads. That is the finding of a report from Stamford, CT-based MRCA Informations Services which collects data from nearly 5,500 individuals in 2,000 nationally representative households.

Fruit and fruit salads are eaten as dessert with meals an average of 72 times per year per person, according to the report. This is more often than cakes and cookies combined – the second and third most popular desserts in this country.

To capitalize on fruit's growing popularity due to its health appeal, food processors are incorporating fruit into more new products. Strawberries, the most common fruit ingredient, were included in 219 new foods last year as compared to 118 for the previous year, according to Marketing Intelligence Services. Orange, apple, cherry, and raspberry (in that order) were the next most common fruits incorporated in new products last year.

Kiwi, which didn't find its way into any new products in 1985, was added to six new products in 1986. An example of a kiwi item introduced last year was Sliced Kiwi Fruit

(Continued on page 64)

Introductions of Foods Containing Fruit

Fruit	1986	1985
Apple	149	100
Apricot	39	23
Avocado	6	3
Banana	62	37
Blackberry	20	8
Blueberry	69	44
Cherry	141	86
Cranberry	23	9
Dates	17	20
Grape	64	26
Grapefruit	9	5
Guava	6	0
Kiwi	10	3
Lemon	96	54
Lime	35	13
Mandarin	17	6
Mango	1	1
Orange	168	105
Passion fruit	0	1
Peach	59	46
Pineapple	33	12
Plum	25	23
Raspberry	136	67
Strawberry	219	118
Watermelon	12	5

Source: Marketing Intelligence Services

in light syrup from Pacific Marketing, Westlake, CA.

The alcoholic beverage category that showed the greatest growth last year was one with added fruit juice – wine coolers. 1986 was the year that wine cooler sales topped $1 billion. But a shakeout of this category also began last year, with several brands being pulled off the market. This shakeout made it important for new wine coolers to really offer something new. One of these is Cod Cranberry Cooler – it is made from cranberry wine, not wine made from grapes or a malt base. While this product wasn't initially introduced last year, it was expanded into new markets during 1986.

Non-alcoholic beverages containing juice also saw growth last year. Consumption of fruit juice and noncarbonated drinks is slated to grow 9.8 percent per year to reach a manufacturers' sales level of $16.7 billion in 1994, according to Business Trend Analysts.

Dole Food Co., San Francisco, expanded its Pineapple Breakfast Juices into New England during 1986. Previously they were only available in the western United States where sales quickly surpassed projected volume.

Kashu Fruit Products, Inc., Corona, CA, introduced C-Burst All Natural Juice Drinks with whole juice cells last year. The orange or grapefruit varieties each contain 15 percent orange or grapefruit juice and 10 percent citrus cells.

While fruit juices and fruit drinks remain one of the smaller segments of the overall drink category, Marketing Intelligence Services forecasts that this segment will see major expansion during the remainder of the 1980s and 1990s. One area expected to grow is fruit teas. Boulder, CO-based Celestial Seasonings, Inc., a division of Kraft, introduced its Fruit & Tea – a blend of black tea with 50 percent real fruit, herbs, and spices – towards the end of last year. Varieties offered are: Oranges & tea, lemons & tea, raspberries & tea, apple spice & tea, and citrus & tea.

It is common knowledge that fruit juice is also being added to a number of carbonated beverages – many at the 10 percent level. But a host of new products are being introduced with higher levels of fruit juice. Fruitzer, from Fruitzer Company, New York, is 100 percent sparkling fruit juice. It is offered in apple, grape, cherry, and cranberry varieties.

Snack foods is another category where food processors are capitalizing on consumers' heightened interest in fruit. Dallas-based Frito-Lay – in a departure from salty snacks – introduced McCracken's Apple Chips into test market. And T.J. Lipton added two new varieties to its successful Fun Fruit line. Tropical fruit, berry bunch, and fantastic fruit punch varieties were added to existing cherry, grape, orange, and strawberry varieties. Described as bite-size, chewy, real fruit snacks, Fun Fruit were originally introduced in July of 1985.

The $256 million frozen fruit/juice category also saw a lot of new product action last year. Quaker Oats began testing a line of frozen fruit ices under the Great Arctic Fruit Co. brand. Other 1986 introductions in this category included: United Brand's Chiquita Fruit & Juice Pops and Fruit & Cream Bars, Sara Lee's Popsicle Industries' Fruitsicles, General Foods' Jell-O Fruit & Juice Bars, and Coca-Cola Foods' Minute Maid Fruit Juices.

Sunkist
TROPICAL FRUIT
Fun Fruits
Chewy Real Fruit Snacks
Made With Real Tropical Fruit
6 Pouches

Food manufacturers have capitalized on consumers' heightened interest in fruit with products such as T.J. Lipton's Fun Fruit line which was expanded in 1986.

"Lite" or "Less of"

Americans' preoccupation with health and fitness is definitely impacting their eating habits. During 1986, sales of diet foods grew at a much faster rate than sales for comparable food products – a trend that will continue, according to the Stamford, CT-based market research company, Business Communications Co., Inc. (BCC). BCC points out in its report *Diet Foods: Markets, Developments, Players* that sales of all types

(Continued on page 69)

Insert 44 or see FEM, p. 31→

Manufacturers' sales of selected reduced sodium & sugar foods

	1982	1986E	1995P
Soft drinks	$1,871	$3,486	$11,378
Cereal	535	898	2,426
Candy & gum	278	625	1,638
Sugar substitutes	101	307	683
Canned fruit	124	251	610
Canned vegetables	56	151	478
Hot cocoa mixes	12	93	193
Sauces & dressings	42	83	232
Spreads & syrups	59	80	108
Meats & seafoods	27	58	265
Salt substitutes	36	30	50

E - Estimate P - Projection Source: Business Trend Analysts

CLASSIC LITE
LESS THAN 300 CALORIES
DINNER FROM ARMOUR
NEW
ROAST BREAST OF CHICKEN

As more and more consumers become concerned with health, and hence, the amount of calories consumed, more products such as Classic Lite Meal from Armour Frozen Food are appearing on the market.

of diet foods and beverages will grow at an average annual rate of 7.3 percent over the next five years. And it will reach at least $28.8 billion by 1990. Much of this growth will come from new products, the report points out.

Of the foods introduced in 1986, 207 were listed specifically as diet products, 38 as light foods, and 34 as lite foods, reports Marketing Intelligence Services. In 1985, these figures were 101, 20, and 35, respectively. And several studies have shown that non-dieters often consume more light/low-calorie foods traditionally believed to be targeted for dieters.

Frozen entrees with reduced calories continue to be popular. Le Menu Light Style Dinners from Campbell Soup, Gorton's Light from General Mills, Mrs. Paul's Light Seafood Entrees, Classic Lite Meals from Armour Frozen Food, and On-Cor Lite Frozen Entrees were all 1986 introductions.

Salt-free and sugar-free foods are growing at an even faster rate than "diet foods." According to Business Trend Analysts (BTA), Inc.'s report, *The Markets for Salt-Free and Sugar-Free Foods*, growth of salt-free and sugar-free foods has averaged 18 percent over the past several years, compared to an average annual growth rate of just over three percent in the overall food industry. The report continues to point out that "the big winners in the market for sugar-free foods have been hot cocoa mixes, beverages, sugar substitutes, candy and gum, and canned fruit, while low-sodium canned vegetables, and meats and seafoods have flourished in the market for salt-free foods."

Reduced sugar

The approval of aspartame in 1981 began a revolution in the sugar-free food category. The soft drink industry was perhaps the greatest beneficiary of aspartame's approval – aspartame was first allowed in soft drinks in the U.S. in 1983. BTA predicts that the 1995 sugar-free segment will claim greater than 40 percent of the projected $27 billion in soft drink sales.

In the dry mix beverage category, General Foods introduced two aspartame-sweetened varieties of Kool-Aid in 1986 – Strawberry Falls Punch and Raspberry.

The reduced sugar category will continue to expand – especially with the U.S. Food and Drug Administration's November 1986 ruling which approved the use of aspartame in several new categories of foods. This decision opened the way for the introduction of TreeSweet Lite juices with one-third less calories than regular juice. Available in frozen concentrate and chilled forms, the new line from Houston-based TreeSweet Companies is sweetened with aspartame.

The market for sugar-free and low-sugar foods will continue to post gains of roughly 13 percent per year over the course of the next decade, predicts BTA.

Reduced sodium

While sodium's exact role in high blood pressure continues to be debated, it is accepted that excess sodium consumption is one factor contributing to this condition (stress and obesity are some others).

Americans have been reducing sodium intake – usually by reducing salt intake. This has provided opportunities for marketers of low-sodium foods. Sales of low-sodium canned vegetables, for example, have grown at a rate of 28 percent per year, help-

(Continued on page 70)

ing to revive an otherwise stagnant category, according to BTA's report on salt- and sugar-free foods.

It was during 1986 (July) that FDA published its long-awaited sodium labeling regulations. Several products introduced in 1986 in this category were: Salt Sense – a table salt with 33 percent less sodium by volume than regular salt from Diamond Crystal Salt Co., St. Clair, MN and a salt-free version of General Mills' Pop-Secret microwave popcorn.

Reduced fat and/or cholesterol

New product introductions with reduced fat and/or cholesterol ranged from Ore-Ida Lites – frozen french fries with one-third less oil than regular fries – to Kaukauna Lite cold pack cheese food spread with 50 percent less fat and 34 percent less cholesterol to leaner meats.

Test marketing of UltraBeef Natural/Lite began in 1986. Ninety to 95 percent fat-free, or 46 percent lower in fat than corresponding cuts of regular beef, UltraBeef is produced by controlled or planned breeding and selection. UltraBeef is distributed and marketed by Baltimore-based Mash's Meats. Its test market success led to expanded distribution in early 1987.

Breakfast Foods

Americans' increased concern about their health has resulted in an increased awareness of the importance of breakfast. At least this is a logical conclusion to draw if one looks at the rising sales of breakfast foods. Not only are more prepared breakfast items being sold, consumers are being offered a greater variety of convenient breakfast foods.

In a study, *The Market for Breakfast Foods*, Business Trend Analysts broke down breakfast foods into three product areas:

1) Frozen Breakfasts and Pancake/Waffle Preparations – encompassing frozen waffles, French toast, pancakes, and breakfast entrees; and pancake and waffle mixes and batters.

2) Cereals – including both hot and cold cereals – as well as baby cereals.

3) Baked Breakfast Foods – covering a wide variety of items which are commonly associated with breakfast such as bagels, toaster pastries, muffins, English muffins, croissants, sweet rolls, coffee cake, donuts, and pastry.

Together, these products comprised an $8.7 billion market in 1985, and were estimated by BTA to reach $9.4 billion in 1986.

Bagels is the fastest growing category of baked breakfast foods, with the possible exception of toaster pastries, according to BTA. Yet a tremendous potential for expansion of the bagel market exists since four out of five American have never eaten a bagel, BTA continues.

The smallest category of breakfast foods is the frozen breakfast and frozen pancake and waffle group, although it is slated by BTA for the most optimistic future. Presently the field is dominated by Campbell Soup Co., ConAgra, IC Industries' Pet division, and The Quaker Oats Co. They're going after the consumer who eats breakfast

Aunt Jemima Pancakes
ORIGINAL FLAVOR
8 PANCAKES · NET WT 9¼ OZ · 262g
KEEP FROZEN
FOR TOASTER AND MICROWAVE
Aunt Jemima Pancakes
BLUEBERRY
8 PANCAKES · NET WT 9¼ OZ · 262g
KEEP FROZEN
FOR TOASTER AND MICROWAVE
Aunt Jemima Pancakes
BUTTERMILK
8 PANCAKES · NET WT 9¼ OZ · 262g
KEEP FROZEN
FOR TOASTER AND MICROWAVE

Aunt Jemima Pancakes from The Quaker Oats Co. are among the host of new breakfast foods available.

at fast food outlets.

In May of 1986, for example, Campbell Soup announced the national rollout of Great Starts Breakfast Sandwiches – a four-variety line of breakfasts on muffins or biscuits which can be heated in microwave or conventional ovens. In making the introduction, Archie van Beuren, product marketing manager for Campbell Soup Frozen Foods, said, "With Great Starts Breakfast Sandwiches, consumers now can enjoy in their homes the same kinds of breakfast sandwiches that have become so popular in fast food restaurants."

"There is tremendous interest in frozen breakfasts," van Beuren continued. "From 1980 to 1984, frozen breakfasts grew in dollar sales by 61 percent. Also of relevance is the fact that between 1977 and 1984, breakfast sales at restaurants jumped 56 percent. Breakfast sandwiches represent 18 percent of all breakfasts served in restaurants."

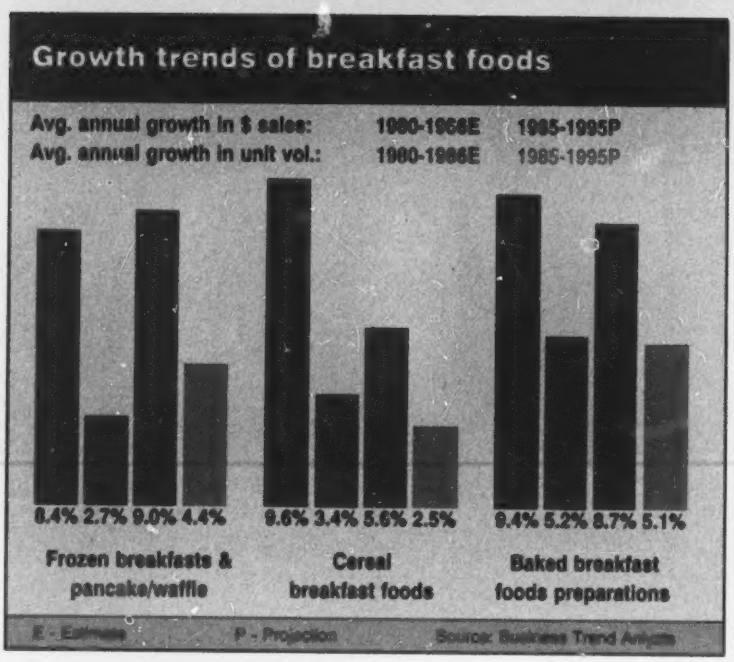
The Quaker Oats Company expanded its offerings of frozen breakfast items in 1986 with the introduction of a three-item line of Aunt Jemima Homestyle Breakfast entrees and three hash-brown potato patty products under the Aunt Jemima Toaster Browns name. The entree items are: Pancakes with sausages, French toast wedges with sausages, and Pancakes with bacon slices. Available in Ohio, Indiana, Michigan, Kentucky, Virginia, West Virginia, and Wisconsin, they feature Swift Premium Brown 'N Serve Sausage and Swift Premium Bacon. Toaster Brown comes in original, onion, and western style varieties.

Sales of breakfast cereals grew at a 9.6 percent annual rate throughout the first half of the 1980s, reports BTA. The marketing research firm cites burgeoning demand for high-fiber bran cereals as a partial reason for this growth. Raisin Nut Bran Cereal from General Mills, Inc. and Golden Temple Natural Blueberry Whole Grain Cereal from Golden Temple, Eugene, OR, were among the new cereals in 1986 aimed at the health conscious.

On the other end of the scale, a number of new children's cereals were also introduced in 1986. Included in this group are Rocky Road Cereal from General Mills, Inc. and Ghostbusters from Ralston Purina.

Foods with Tofu

While much of Tofu's increased popularity is due to its health-related advantages, a separate category is being devoted to it because of its rising popularity and versatility as an ingredient. Touted as having no cholesterol, tofu is often used as a replacement for dairy products. Currently the tofu industry in the U.S. is a $60 million business with projected sales topping $500 million by the end of the decade.


Growth trends of breakfast foods

E - Estimate P - Projection Source: Business Trend Analysts

Tofu is produced by soaking soy beans in water. The wet beans are then ground and the fibrous material is filtered out. The remaining mixture is heated and a coagulant added so that a soy curd forms. The soy curd is then pressed to separate it from the whey and the resultant product is tofu.

Brightsong Foods introduced Le Tofu last June as a non-dairy product with premium ice cream taste.

New products introduced last year containing tofu included wafers, puddings, cookies, frozen desserts, salad dressings, entrees, cheeses, and soup. Le Tofu was introduced last June as "a non-dairy product that achieves a premium ice cream taste." It is manufactured by Brightsong Foods, Petaluma, CA, which has been developing and distributing tofu products since 1978.

Brightsong also introduced vacuum-packed tofu last year. The company hoped that its introduction would help bring tofu

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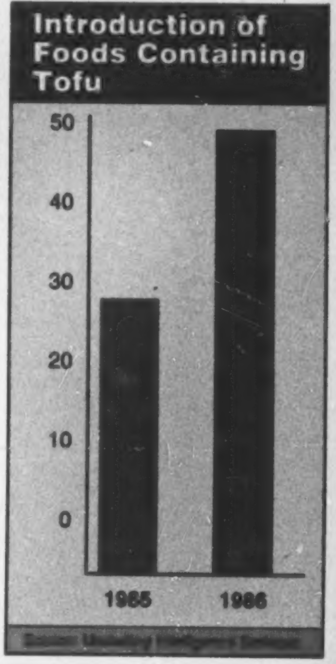

Introduction of Foods Containing Tofu

into the mainstream of consumer products—a direction it is definitely heading.

Another new tofu-based product, Jofu is marketed as the first chilled, spoonable blend of tofu and fruit. Originally introduced in 1985, its distribution was expanded in 1986 to include all of New England. Produced by Greenfield, MA-based Tomsun Foods, Jofu is a spoonable blend of Silken tofu and fruit. In addition to having no cholesterol, Jofu has no lactose; low levels of fat and sodium; and is high in protein, calcium, and iron.

A frozen entree made with tofu is Tofoods Brand Premium Tofu Entrees from Silver Springs, MD-based Tofoods Company. First introduced in 1985, these entrees saw expanded distribution in 1986. Bar-B-Q Tofu, Sweet and Sour Tofu, and Tofu Teriyaki varieties are offered.

Gourmet Foods

Not too many years ago, if one wanted to purchase a specialty food such as extra virgin olive oil, imported Icelandic lumpfish caviar, a wine vinegar made from Chardonnay wine, or even fresh pasta, only a few options were available. Certain supermarkets possibly carried it in their limited gourmet section or, more likely, one would have had to locate a specialty food store or place an order through a mail order house which handled gourmet foods.

Stores Selling Gourmet Foods

Type	1980	1986
Supermarkets	20,000	30,000
Specialty Food Stores	6,000	25,000
Department Stores	100	1,200
Catalog, Other (Cookware, Coffee, Candy, Cheese)	200	9,000

Source: Frost & Sullivan

Ice cream toppings from Godiva are one of the many gourmet foods introduced last year.

Now, purchasing gourmet foods has become much easier due to their increased popularity with a consuming public more educated about food. The entrance of major manufacturers like McCormick, Kraft, and General Foods has also made these upscale foods more accessible.

Frost & Sullivan (F&S), a New York City-based marketing research firm, has been tracking gourmet food sales. F&S reports that the number of specialty food stores has risen from 6,000 in 1980 to 25,000 in 1986. And the number of supermarkets with some sort of gourmet section went from 20,000 to 30,000 during the same period.

Although almost half of the specialty retailers in a F&S survey felt that gourmet sales in supermarkets hurt their business, some felt the opposite is true. Since gourmet food sections in supermarkets help educate consumers, making them more familiar with specialty foods, this helps the sales of these foods. Either way, the supermarket is expected to have the best potential for increased sales of gourmet foods over the next ten years.

A precise definition of gourmet foods presents a challenge at best. Frost & Sullivan did come up with one based on discussions with distributors and retailers in the business, and from surveys of representative groups from both segments: "Gourmet foods are comprised of excellent ingredients, blended through a careful process of manufacture into the highest quality items possible."

Based on this definition, 1986 retail sales of gourmet food products was estimated to be $8.5 billion. F&S projects a growth rate averaging eleven percent through 1990.

Several subcategories within gourmet food saw an exceptional amount of activity last year. These were:

•Beverages. Nonalcoholic malt beverages, specialty sodas, specialty coffees and teas (including herbal teas), and sparkling mineral waters are usually marketed as gourmet beverages. 1986 was the year that Mrs. Fields announced the introduction of Diet Chocolate Soda and Macadamia Nut Soda. Produced through a joint venture with AGS Brands of Burlingame, CA, these new sodas were expected to be in national distribution by early 1987.

•Desserts – including chocolates. High-priced chocolates – especially truffles – are becoming commonplace. Godiva Chocolatier announced a new line last year: Barringer's American Chocolate. Suggested retail price of the line is $14.00 a pound. The Godiva line retails for approximately $21.00 per pound. Earlier in the year Godiva introduced the Ivory Collection – an assortment of white-coated candies.

Chocolate is also finding its way into other new gourmet desserts. Pepperidge Farms, Norwalk, CT, introduced Distinctive Chocolatier Cookies in three varieties last year. The 4 1/2- to 6-ounce packages, which retail for $1.99, have "please keep cool" printed on the side. And Godiva introduced a line of dessert sauces last year, most of them containing chocolate.

One of the most successful gourmet categories is that of super premium ice creams, with a number of companies battling for a piece of the action. Sales for 1986 were greater than $2 billion, or approximately 16 percent above 1985 sales. This is while sales of traditional ice cream are growing at less than five percent a year.

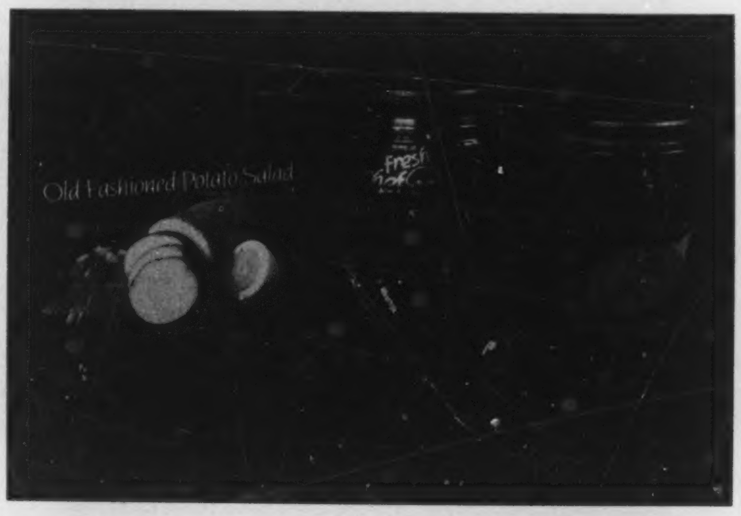
DoveBar International, Chipwich Inc., and Pillsbury's Häagen-Dazs were among the companies introducing new products in this category last year. Love Bites are new chocolate-covered ice cream treats from Chipwich. Häagen-Dazs expanded its sorbet-and-cream line by adding new flavors. And DoveBar added a Delight Sundae to its offerings.

Another gourmet ice cream product is Viennetta Ice Cream Dessert From Good Humor, Fairfield, NJ. Viennetta was originally introduced in 1985 with expanded distribution taking place in 1986. It is now available in 40 to 45 percent of the country. New varieties were also added. Originally offered in chocolate or vanilla 20-ounce sizes, a 10-ounce package with two single-serve pieces are offered. The new size comes in vanilla or chocolate mint varieties.

Mousse du Jour was also introduced last year. Produced by Glacial Confections, Inc., Westport, CT, it is described as combining French mousse with American super-premium ice cream.

•Condiments. New products to this category include vinegars, sauces, and specialty olive oils. Secaucus, NJ-based Bertolli USA, Inc., for example, launched a new line of imported premium food products which includes Bakdia al Monte Extra Virgin Olive Oil and "Chianti Aretino" wine vinegar.

Other gourmet food categories include specialty cheeses, caviar, seasonings, and jams and jellies. A new specialty cheese line made from goat's milk was announced last year. Hailing from The Kendall Cheese Co., Atascadero, CA, the line includes: Chevrefeuille, a soft-ripening pure goat milk cheese; Petit-Chevre, drier and more pungent than Chevrefeuille; Chevre Blue, made from a blend of 75 percent goat milk and 25 percent cow milk; Chevre Frais; and Creme Fraiche.



Campbell Soup Company's Fresh Chef line was developed in response to consumer research indicating a need for fresh, refrigerated salads. The line has expanded to include soups and sauces.

Fresh

The word "fresh" has come to signify high quality and health to many of today's consumers. And numerous food processors jumped on the "fresh" bandwagon with the products they introduced in 1986. In some cases, this has been done to combat the loss of prepared food sales to foods prepared on-site in supermarkets' own delis and bakeries.

Campbell Soup Co. expanded its Fresh Chef line in 1986. The Fresh Chef line now, however, includes six soups, nine salads, and six sauces – all refrigerated. This line was developed in an effort to match restaurant quality. Currently, it is in 83 percent of the country by population. The heaviest penetration is in metropolitan areas since the product is geared more toward urban

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markets. The only states where Fresh Chef is not available are: North and South Dakota, Louisiana, Arkansas, Mississippi, Montana, Idaho, and New Mexico.

Consumer research showed Campbell that consumers wanted fresh, refrigerated salads to eat either as side dishes with their meals or as healthful snacks or lunches. And so Campbell first introduced salads, with a shelf life of 23 to 28 days from the date of manufacturer.

Refrigerated salad dressings is another area to benefit from Americans' insistence on fresh. Annual growth of nine percent is predicted for refrigerated salad dressings by Packaged Facts, Inc., a New York City research company. Although, annual growth for other salad dressings – pourable, spoonable, and dry – is only predicted at under four percent.

"It's an ironic situation that in an era when Americans are eating more salad than ever before, either at home or outside, they are – with the exception of refrigerated dressing – not buying more packaged salad dressings," commented David A. Weiss, Packaged Facts president. A Packaged Facts study notes that because refrigerated salad dressings are so closely identified with the "quality trend," their immediate future is assured.

One of the refrigerated salad dressings introduced last came from Dania, FL-based Captain Rick's. A regional product, Captain Rick's Gourmet Ceasar Salad Dressing is available in Miami.

A number of refrigerated entree and main meal items were also introduced last year (see accompanying chart).

Refrigerated Main Meals Introduced in 1986

Product Name	Manufacturer
Japanese Style Fresh Noodles	Azumaya
DeWitt's Table Ready Meat	Bil-Mar Foods
Campbell Express Line	Campbell Soup
Heat 'N Eat Country Egg 'N Muffin	Country Smoked Meats
Canadian Bacon Egg and Muffin	Country Smoked Meats
Frieda of California Table de France Crepes	Frieda of California
Kretschmar Entrees	Gainers
Culinova Refrigerated Dinner Line	General Foods
Gilardi's Crispy Micro-Wave Pizza	Gilardi's Pizza
Lambert's Fresh Pizza	Lambert's Pasta and Cheese
Salemos Rolls	Long Island Specialty Food Distributors
Salemos Crunchy Pups	Long Island Specialty Food Distributors
Marielle Quiche	Marielle Foods
Nasoya Foods Oriental Cuisine Fresh Noodles	Nasoya Foods
Natural Prepared Entrees	Natural
Azteca Mexican Food Line	Pillsbury
Azteca Taco Shells	Pillsbury
Azteca Tortillas	Pillsbury
Meats-To-Go	R.B. Rice
Tolona Pizza	Tolona Pizza

Source: Marketing Intelligence Services

Fresh, prepared chicken items was another hot category in 1986. Showell Farms, Showell, MD, for example, added Chicken Nuggets, Aloha Strips, and Cutlets Roma to its line of Cookin' Good chicken products. These fully-cooked, breaded, boneless chicken items are sold in the fresh poultry section of supermarkets.

At the National Food Processors Association's annual conventional earlier this year, Martin B. Buchalski of Campbell Soup gave recommendations for processors interested in introducing refrigerated products. The first one was that "the product quality should be equal to or better than restaurant take-out." He also cautioned that product safety is of paramount importance.

Ethnic

The quest for more exciting meals is driving consumers to ethnic foods more and more – and not just Mexican, Italian, and Oriental but also Cajun, Indian, and others. And this is responsible for ethnic foods' contribution to major growth patterns in retail food sales.

If one particular ethnic food played a dominant role in 1986, it would be Cajun. 1986 was the first year that a major processor marketed a line of frozen Cajun entrees. Pet Incorporated, an IC company, announced the purchase of Louisiana Seafood Packers, Inc., manufacturers of Cajun Cookin', in April of 1986.

Cajuns, centered in southern Louisiana and southeastern Texas, are descendants of French-Canadian (Acadian) colonists. After being persecuted and expelled from Nova

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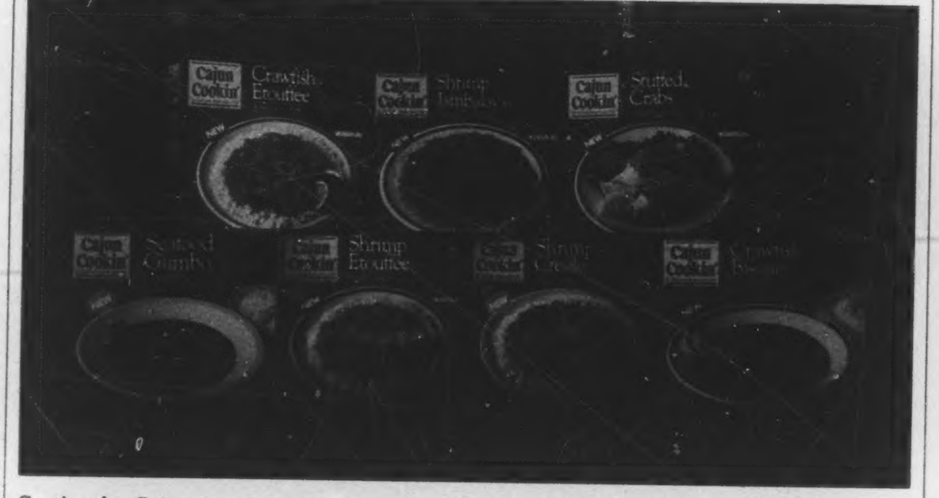
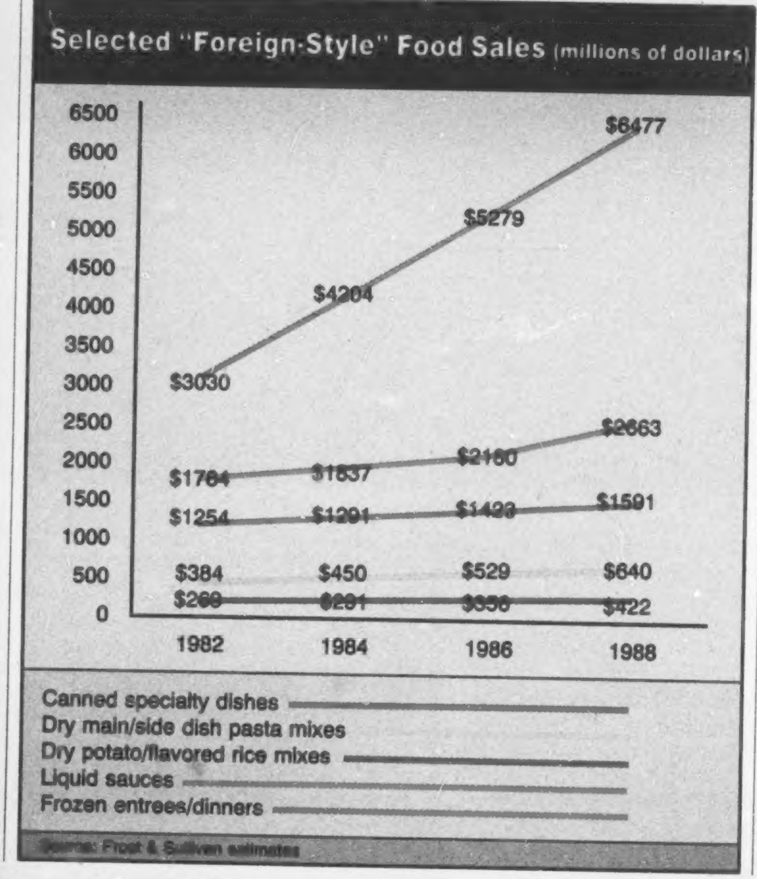

Cajun Cookin' Crawfish Etouffee
Cajun Cookin' Shrimp Jambalaya
Cajun Cookin' Stuffed Crabs
Cajun Cookin' Seafood Gumbo
Cajun Cookin' Shrimp Etouffee
Cajun Cookin' Shrimp Creole
Cajun Cookin' Crawfish Bisque
NEW

Cajun foods played an active role in new product introduction last year. The purchase of Louisiana Seafood Packers, Inc.—manufacturers of Cajun Cookin'—by Pet Inc. brought a major manufacturer into this arena.

Scotia, the Cajuns settled in the Louisiana bayous in the late 1700s. Unable to find many "European-style" ingredients, Cajuns used what was available—foul, game, shellfish, pork, peppers, and rice. (Creole cooking is a "city-style" similar to Cajun, but more refined in appearance and less spicy).

The Cajun Cookin' line currently includes: crawfish bisque, seafood gumbo, crawfish etouffee, shrimp etouffee, stuffed crabs, shrimp jambalaya, and shrimp creole. Additional items are being planned.


Selected "Foreign-Style" Food Sales (millions of dollars)

Source: Frost & Sullivan estimates

Other Cajun foods introduced last year by major processors included: S&W Cajun Style Stewed Tomatoes from S&W Fine Foods, San Mateo, CA; and a line of three cooking sauces from Kraft. Kraft's Makin' Cajun line consists of Creole, Spiced Brown, and Spiced Fruit.

While Cajun foods made a big splash last year, they certainly were not the only ethnic foods introduced. Mexican foods continue to remain popular among U.S. consumers. And Foodways National capitalized on this trend by offering a line of Mexican low-calorie frozen entrees. Marketed under the Weight Watchers brand, Foodways National's new line offers five varieties: Beef enchiladas ranchero, chicken enchiladas suiza, cheese enchiladas ranchero, beefsteak burritos, and chicken burritos. Each entree comes in two single-serve portions in a single tray. Foodways reports exceptional success with this line.

La Preferida Inc, Bronx, NY, introduced a ready-to-eat burrito filling in a 15 ounce can—enough for six to eight burritos. Suggested retail price for the can is $1.25.

Another prepared, frozen ethnic food to hit retail shelves in 1986 was Curry Creations—a line of frozen Indian microwaveable dinners. Manufactured by Indica Foods Corporation, Chappaqua, NY, the line is available in New York, New Jersey, Connecticut, Washington, Virginia/D.C., and Philadelphia.

Curry Creations contain boil-in-bag pouches of chicken, shrimp, or vegetarian tofu curry paired with pouches of rice pilaf. The rice pilaf is also offered separately.

A major food processor to capitalize on Americans' interest in Oriental foods was General Mills with the introduction of Oriental Classic. These packaged dinner mixes are prepared by adding beef, poultry, tofu, or seafood, and offer sweet & sour, stir fry rice, chow mein, and teriyaki varieties.

Oriental Classics consists of a plastic mesh pouch containing rice and some vegetables; a foil pouch with vegetables in a sauce; and a seasoning or topping pouch. They retail for approximately $2.49 a package. The decision to introduce this line was based on the growing popularity of Oriental food; the health appeal of Oriental food; and the fact that many consumers don't know how to prepare Oriental foods.

One ethnic food category which has become so popular in America that we often don't think of it as ethnic is Italian. And an especially popular subcategory of Italian food is pasta – so much so that a blizzard of Americanized pasta dishes are available. FIND/SVP, a New York-based market research firm, predicts a 12 percent increase in retail sales of pasta by 1990.

In July of 1986, Campbell Soup Company announced the national introduction of Prego al Fresco spaghetti sauce – an expansion of its successful Prego Spaghetti Sauce line. The Prego al Fresco sauce was developed in response to consumer demand for a light-textured, fresher-tasting sauce.

Shortly after that, a new Italian pasta sauce dry mix blend hailed from McCormick last year – Pasta Prima. The line contains five items: herb & garlic, Alfredo, marinara, pesto, potato salad vinigarette, and herbs & seasonings. Aimed at consumers who want a more upscale product, these sauce blends were developed to duplicate restaurant quality at home.

Pasta Prima was rolled out directly into national distribution last September after consumer testing showed an 80 percent interest in the concept. Sixty percent of the consumers tested said that they would definitely buy the product. And 80 percent thought Pasta Prima was easy to prepare and had a fresh taste once prepared.

Convenience Foods

The increasing number of women entering the workforce is a major driving force behind consumers' need for foods that can be prepared quickly.

A number of the new foods introduced last year were developed to hasten preparation time in the home. One of these – Suddenly Salad from General Mills – provides a dry mix of potato or pasta and dehydrated vegetables in a flow-through pouch. The salad is prepared by placing the flow-through pouch in boiling water. Once the contents are cooked, the pouch is drained and mayonnaise or salad dressing is added. A seasoning packet, which is included with the salad mix, is then blended in.

Introduced into test market last spring, Suddenly Salad is now available nationally. Potato salad, Italian pasta, classic pasta, and creamy macaroni varieties are available. (Hard boiled eggs also need to be added to the potato salad.)

Fantastic Foods, Novato, CA, also introduced Pasta Salad Mixes last year. They combine rotoni pasta with either Italian Herb or Spicey Oriental seasoning blend.

On the sweet side, Hauser Chocolatier, Inc., Bethel, CT, introduced a Gingerbread House Kit which requires no baking to

(Continued on page 80)

Classic Pasta
Suddenly SALAD
NEW!
Creamy Macaroni
Suddenly SALAD
NEW!
Italian Pasta
Suddenly SALAD
NEW!
Creamy Potato Salad
Suddenly SALAD
NEW!

Suddenly Salad from General Mills offers consumers a new food with reduced preparation time.

make. The house is made from honey-dough gingerbread in "pre-fab" pieces. The kit is completed with supplied candies, cinnamon sticks, royal icing mix, disposable pastry bag and instructions.

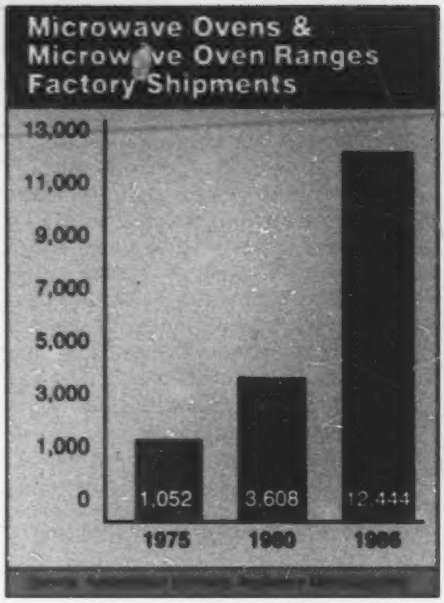
While a number of items introduced last year allow consumers to prepare "home-made-style" foods with reduced preparation time, the real action in the convenience category was in microwaveable products. 1986 was the year when microwave penetration in homes passed the 50 percent mark. The 12.4 million ovens shipped in 1986 accounted for over one-fourth of all 1986 appliance shipments and the largest annual shipment in history of any major appliance product, reports the Association of Home Appliance Manufacturers.

While microwaveable packaging is having an increasing effect of consumers' decisions of what foods to buy, this is by no means a mature market. Some indication of how consumers most often still use their microwaves, is the fact that microwave popcorn remains the top-selling product in the microwaveable category. But consumers will become more serious microwave cooks, and improved quality will be a major selling point of many new microwaveable foods. For example, Gorton's new Microwave Crunchy Fish Sticks and Fillets come with a package designed to be placed directly in a microwave oven. The package was also designed to insure a crunchy coating on the outside of the fish while the inside remains moist and tender. Patterson Frozen Foods, Patterson, CA, also introduced a product which cooks right in the box – Microfresh Vegetables.

Pillsbury was among the first to offer products specially designed for use in microwave ovens with the 1978 introduction of frozen microwave popcorn. Not a company to rest on its laurels, Pillsbury continues to introduce a host of microwaveable products. Pillsbury products introduced last year developed for specifically for microwave preparation are: Microwave Cake Mixes, Microwave French Bread Pizza, Microwave Pancakes, and Classic Microwave Casseroles.

In an effort to compete with Pillsbury for a piece of the $459 million microwave foods market, Quaker introduced Golden Grain Microwave Rice-A-Roni. It is available in selected western markets.

Last year also saw the introduction of Johnson's Hot Scoop-–a microwaveable ice cream sundae – and Seneca Baked Apples – developed by Marion, NY-based Seneca Foods Corp. to be prepared in a microwave oven.



In accepting the challenge to help microwave ovens serve consumers better, Hormel developed its *New Traditions* line. The first products in this line – pre-broiled and browned breakfast meats – appeared on the market in early 1986. In the past, cooking meats has not been one of the more common uses of microwave ovens due the unsatisfactory results.

Too many new products?

Many of 1987's new food products will follow already established trends. But will the number of new foods continue to increase? Introductions so far this year indicate they will, although some skepticism has been expressed. At an American Marketing Association new-products conference held a few months ago in New York City, Herb Baum, Campbell USA President, said that while new products "are the lifeblood of consumer package goods, we all introduce too many."

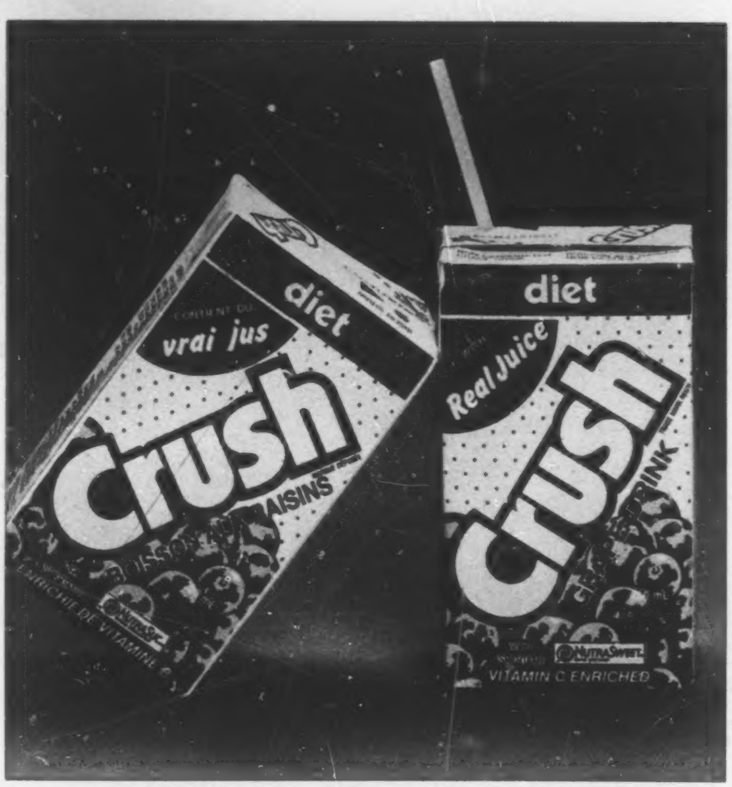
"The obsession with new products in many companies diverts attention and funds from existing products – the ones that generate the revenue to pay the bills," he continued.

Another caution to food manufacturers from Baum was that grocery retailers have become more effective and innovative in following consumers trends than food manufacturers.

The most important point, though, is that food manufacturers must – no matter how many new product they introduce – stay tuned to consumers needs and desires when developing products.

SUGAR UNDER FIRE

Corn sweeteners surpass sucrose as the nation's top sweetener. HFCS volume levels off but crystalline fructose, dry HFCS and new aspartame approvals will further cut sucrose use. Waiting in the wings: A host of new sweeteners.



Aspartame can be used in aseptic fruit drinks, where pH is ideal, if exposure time to high temperature is minimized and followed by rapid cooling. Application shown here is from Canada, a petition is pending in U.S. (Photo: NutraSweet)

Sugar (read "sucrose") is under increasingly heavy fire on two fronts: Cost and diet. New developments in corn sweeteners and aspartame are leading the attack, and a host of new sweeteners are mustering behind the lines to charge if and when they gain regulatory approval.

Corn sweeteners, less costly than sucrose, now account for more than half the caloric sweetener use in the U.S.—52 percent in 1986. According to USDA, refined sugar use in the U.S. fell steadily from 9.52 million short tons (dry basis) in 1980 to 7.32 MST in 1986 and will slide further to 7.2 MST this year. Corn sweetener use, meanwhile, soared from 4.58 MST in 1980 to 8.12 MST last year and will reach 8.26 MST in 1987. Major contributor: High-fructose corn syrup, which more than doubled from 2.18 MST in 1980 to 5.53 MST last year as soft-drink bottlers shifted from sucrose and invert sugars to 100 percent HFCS to sweeten their non-diet products. USDA projects 1987 HFCS use at 5.65 MST.

Total sweeteners slip

Overall U.S. sweetener consumption grew from 133.3 million metric tons in 1981 to 149.2 MMT in 1985, then slid to 148 MMT last year. Per-capita consumption of caloric sweeteners jumped from 125 lbs. (dry basis) in 1980 to 131.2 lbs. in 1985, fell off to 129.5 lbs. last year and will slip to 128.5 lbs. in 1987, says USDA. Reason for the decline: Growing applications for aspartame, especially since FDA clearance for carbonated soft drinks in 1983. As shown on the adjoining table, aspartame use soared from 0.2 MMT in 1981 to 13 MMT in 1986 and will continue to climb as FDA clears the sweetener for more applications—as occurred last November (*FE* Jan., '87).

Sucrose the loser

But the decline in caloric sweeteners has all been at the expense of sucrose. Per-capita consumption of refined sugar slumped dramatically from 83.6 lbs. in 1980 to 60.8 lbs. last year and will fall to 59.1 lbs. in 1987, says USDA. Per-capita consumption of corn sweeteners, meanwhile, rocketed from 40.8 lbs. in 1980 to 67.3 lbs. in '86

(Continued on page 108)

CHARLES E. MORRIS
Midwest Editor

Aspartame can even be used in some baking applications, such as frozen fruit pies marketed by McCain Foods in Canada. Fruit fillings are sweetened with NutraSweet/sugar blends to cut calories 30 to 45 percent. (Photo: NutraSweet)

and will reach 67.9 lbs. this year. As noted above, HFCS is the major factor, with per-capita consumption rising from 19.1 to 45.8 lbs. 1980-86 and 46.4 lbs. this year.

Diet controversies

On the diet front, the 230-page Sugar Task Force report released last September by FDA once again clears sugars of all health hazards except dental caries, but it remains to be seen if it will clear away consumer misperceptions about sugar. One popular misconception: Sugar is "fattening," although like any other carbohydrate it contains only four calories per gram. Sugar plays no unique role in causing obesity, says the FDA report, boosting the Sugar Association's promotional campaign which stresses sugar as GRAS, natural, low in calories at 16 per teaspoon and – as the best-tasting sweetener – the standard against which other sweeteners are measured.

On the other hand, aspartame and saccharin offer consumers the opportunity to cut calories without sacrificing sweetness. As shown on the table, however, saccharin consumption slumped dramatically since 1985, mainly due to replacement by aspartame in diet soft drinks. Because saccharin in large doses over long periods causes cancer in laboratory rats, FDA proposed banning saccharin back in 1977 but the sweetener continues in use under repeated Congressional stays of the ban. On Feb. 19, Sen. Alfonse D'Amato (R-NY) introduced a bill to extend the ban moratorium until May 1, 1992.

The Corn Refiners Assn., meanwhile, has circulated reports of recent research which shows that artificial sweeteners have had no effect on lowering the U.S. obesity level and suggests that artificial sweeteners may actually increase appetite and thirst, causing consumers to overcompensate with other foods. NutraSweet Co. in turn is sponsoring research at Harvard Medical School to determine if substituting aspartame for sucrose can help weight loss.

U.S. sugar deliveries to industrial and nonindustrial users, 1980, 1985 and Jan.-Sept. [illegible]

Item	Calendar year		Jan.-Sept.		Fiscal year (FY)		Percent change, FY 1985 to FY 1986
	1980	1985	1985	1986	1985	1986	
	Thousand short tons, refined*						
Bakery/cereal	1,337	1,494	1,131	1,084	1,471	1,447	-1.7
Confectionery	932	1,059	788	782	1,052	1,053	.1
Processed Foods	535	428	351	313	439	390	-11.2
Ice cream/Dairy	450	456	356	347	449	448	-.1
Other	589	441	322	318	420	437	4.0
Beverage	2,161	340	276	211	436	274	-37.2
Nonindustrial	3,353	3,123	2,282	2,250	3,124	3,091	-1.1
Total, including non-food	9,477	7,472	5,609	5,407	7,520	7,270	-3.3

*U.S. deliveries data do not include Hawaii. To convert to raw value, multiply by 1.07.
Source: Sugar Market Statistics, NASS and ERS, USDA.

Sugar: Global glut, U.S. short?

Ironically, in the topsy-turvy world of sugar economics, a global glut plus increased U.S. production may actually lead to a *shortage* of sugar in the U.S. this year.

Most producing nations subsidize production, create surpluses, then subsidize export of their surpluses, while protecting prices at home through tariffs and import quotas. The "world price" of sugar, which averaged 5.1 cents per lb. in 1986, is really a dumping price for subsidized export of surpluses and covered only about 15 percent of world sugar trade last year. USDA forecasts 1987 world production at 100.1 million metric tons, up 2 percent from last year, and consumption at 99.7 MMT, also up 2 percent. Carryover, however, will be 46.8 MMT, continuing the glut.

U.S. sugar production will be about 6.35 million short tons (3.2 beet, 3.15 cane), up 5 percent over last year but deliveries—which fell 3.4 percent last year—could fall another 2 percent this year due to inroads by alternative sweeteners and imported processed foods containing sugar, said Robert D. Barry of USDA at the agency's 1987 Outlook Conference, last December 3 in Washington.

The U.S. supports the price of sugar through loans to producers (against crop collateral, at no cost to the taxpayer) and through import quotas to prevent foreign sugar coming in at prices below loan levels. U.S. import quotas progressively dropped from 2.98 million tons in 1983 to 1.85 million tons last year. On Dec. 15, USDA again lowered the quota to slightly more than 1 million tons, provoking complaints from refiners. According to I.H. Kempner III, chairman of Imperial Sugar Co. and also chairman of the U.S. Cane Sugar Refiners Assn., reduced imports will likely cause regional shortages and higher prices this year in spite of higher U.S. production.

U.S. use of noncaloric and caloric sweeteners, 1980 to 1986

Calendar year	Saccharin	Aspartame	Total of noncaloric sweeteners*	Caloric sweeteners	Total all sweeteners
			Million metric tons, raw value		
1980	7.7	0.0	7.7	125.0	-
1981	8.0	0.2	8.2	125.1	133.3
1982	8.4	1.0	9.4	123.2	132.6
1983	9.5	3.5	13.0	124.6	137.6
1984	10.0	5.8	15.8	126.9	142.7
1985	6.0	12.0	18.0	131.2	149.2
1986	5.5	13.0	18.5	129.5	148.0

*Sugar-sweetness-equivalent. Assumes saccharin is 300 times as sweet as sugar and aspartame is 200 times as sweet.

Source: ERS, USDA statistics.

Commercial-scale pulse-combustion dryer at Purdue University is producing dry HFCS 42 for a Japanese licensee while he builds a plant. (Photo: U.S Development Corp.)

CF: New growth category

Corn-sweetener deliveries surpassed sugar for the first time in 1985, said Barry, but HFCS displacement of sugar is leveling off and "is almost complete." HFCS 55 (55 percent fructose), used in beverages, may grow no more than 2 percent per year, while HFCS 42 (42 percent fructose), with wider potential application, could grow 3-4 percent per year.

Crystalline fructose (which will be commercially available in June from A.E. Staley) "will grow at a faster rate" than HFCS but will take several years to reach its full potential, said E. Raymond Stanhope, vice-president of Staley Continental, at the Outlook Conference.

Unlike crystalline fructose fractionated from sucrose, Staley's *Crystar* (*FE* Sept., '86) is produced from HFCS and comes in several blends and granulations ranging from 35 to 60 cents per pound as compared to 60 to 90 cents per pound for the sucrose-derived product. Crystar is 99.5 percent (minimum) fructose, which in crystalline form is 1.6 to 1.8 times sweeter than sucrose and synergistic with other sweeteners. One unique synergistic quality of fructose: When blended with sucrose, the blend

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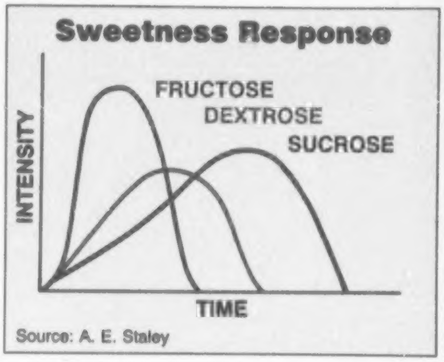

Source: A. E. Staley

is sweeter than either fructose or sucrose alone. Crystar further offers gel properties, reduces set time with starch, lowers water activity and reduces staling in baked goods, says Staley. Typical applications: Powdered beverages, cereal coatings, puddings, gelatins, confections, frozen foods (where it preserves cellular structure) and baked goods.

World demand for corn would soar by 80 million tons if overseas markets were available to liquid corn sweeteners, said Stanhope, but protectionist policies of other nations prevent corn sweeteners from competing with sucrose.

Dry HFCS: Problem solved

Sweet-C 42, a dry 42 HFCS produced via pulse-combustion drying technology (*FE* May, '86), was unveiled February 24 by U.S. Development Corp. at the 1987 International Sweetener Colloquium held by the Sugar Users Group in Palm Springs, CA.

Developed jointly by USDC and Purdue University, pulse-combustion drying combines heat and acoustics to dry viscous products formerly difficult or impossible to dry, and does it at temperatures much cooler than conventional spray drying to reduce product degradation by heat. Early research was assisted by ADM, Amaizo, Cargill, Hubinger and Staley, all HFCS producers. USDC licenses the technology.

Early problems with hygroscopicity in the finished product have been solved by a proprietary encapsulation process, resulting in dry HFCS which disperses readily in cold liquids without cloud or sediment, says USDC President Hayes E. Gahagan. First target market: Powdered fruit juices, sweetened with either Sweet-C 42 alone or in blend with sucrose for synergy. Sweet-C 42 will sell at or below the price of sucrose, said Gahagan. USDC has also successfully dried and encapsulated HFCS 55, 90 and 95 – the last "close to pure fructose."

Aspartame: Heat-stable uses

Aspartame in solution can convert over time to its component amino acids, leading to loss of sweetness (but no off-taste). As with most reactions, conversion rate increases with temperature, limiting the use of aspartame in processes calling for high temperature over extended periods of time.

But aspartame can be used in many heat applications if a few simple rules are followed, said Dr. Barry E. Homler, director of applications for The NutraSweet Co., at the Sweetener Colloquium.

Stability of *NutraSweet* is affected by three interrelated factors: Time, temperature and product pH, Homler explained. As time at any given temperature increases, percentage of remaining NutraSweet decreases; as temperature increases for a given time, the amount of NutraSweet again decreases. pH will produce different effects over varying time/temperature ranges.

NutraSweet is most stable in the 2.5 to 5.5 pH range, where most foods exist, with optimum pH at 4.2.

Adverse effects of heat on NutraSweet can be minimized, said Homler, by:

- Adjusting pH closer to optimum;
- Reducing exposure time to high temperatures by adding NutraSweet during the last stages of cooking;
- Rapid cooling following cooking.

Example: For refrigerated or frozen (concentrated) fruit drinks (two of the categories cleared for NutraSweet by FDA last November), pH of 3.3 to 3.6 is near optimum for NutraSweet. HTST processing conditions for refrigerated products is 185-210°F for 15 to 30 seconds with rapid cooling. NutraSweet loss in processing is only 2-3 percent. Use levels will depend on sweetness profile desired but are probably in the 350-450 ppm range. Shelf life for refrigerated drinks is 6 to 8 weeks, for frozen concentrates more than a year.

By following the rules listed above, NutraSweet can even be used in UHT-processed aseptic products, especially fruit drinks where pH is near optimum for NutraSweet. Example: Diet Crush aseptic fruit drinks, sweetened with NutraSweet and marketed in Canada. (Squirt has petitioned FDA to clear NutraSweet for aseptic fruit drinks here.)

NutraSweet can even be made heat-stable for certain baking applications. Example: *Lite Delite* frozen fruit pies marketed in Canada by McCain Foods. According to the label, fruit fillings are sweetened with a synergistic blend of NutraSweet and fructose-glucose and/or invert sugar and

(Continued on page 114)

Breath Savers
Breath Savers

Breath mints were one of four new food categories cleared for aspartame by FDA in Nov., 1986. Nabisco Breath Savers are marketed in Canada, similar products will soon be seen here. (Photo: NutraSweet)

dextrose to reduce calories by 30 to 45 percent, depending on pie variety. Again, pH of the fruit fillings is ideal for NutraSweet at about 3.5. In processing the fillings, NutraSweet is added after heating. The consumer bakes the pie at time and temperature sufficient to brown the crust and warm the filling without degrading the sweetness of NutraSweet.

NutraSweet is only a sweetener and flavor enhancer, Homler points out, so in some applications it must be used with a bulking agent such as maltodextrin, polydextrose or sorbitol (or sugars, as in the fruit pies) to replace the functionalities of sugar.

Another aseptic application for NutraSweet in Canada: Reduced-calorie fruits for yogurt, aseptically processed and packaged bag-in-box by Flavor Shades Co., a unit of Shade Foods. Lucerne Milk Co., a division of Safeway Stores, introduced reduced-calorie yogurt in May, 1986, and there are now four brands on the Canadian market – three with fruits sweetened by NutraSweet alone (with bulking agents), one with fruits containing a NutraSweet/sugar blend. Calories are reduced by 50 percent as compared to conventional yogurt. Reduced-calorie yogurt is a "rousing success" in Canada, where it has expanded the total yogurt market "with little cannibalization of regular yogurt," reports Timothy J. Coughlin, national accounts manager for NutraSweet in Canada.

Flavor enhancers & potentiators

Glycyrrhizin, a non-caloric extract of the licorice root 100 times sweeter than sucrose, is marketed in several blends as a flavor enhancer and potentiator by MacAndrews & Forbes under the brand name *Magnasweets*, which are boosting flavor and cutting flavor costs in a growing range of foods. "Just a few parts-per-million is usually all that's needed," says the supplier.

Thaumatin, a mixture of sweet-tasting proteins derived from a West African fruit, 2,500 times sweeter than sucrose and synergistic with other sweeteners, is marketed by Tate & Lyle under the *Thalin* brand. Because of its intense sweetness and linger-

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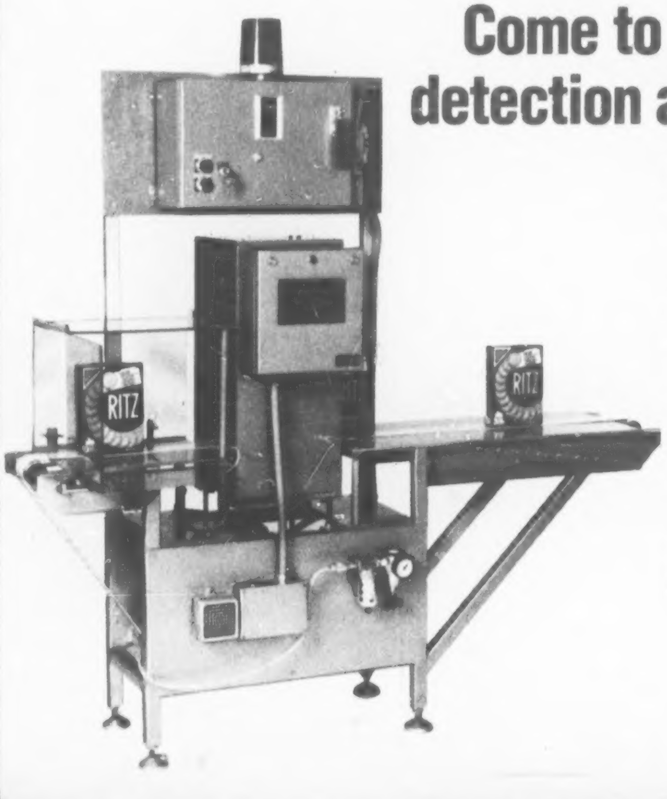

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ing, licorice-like aftertaste, Thalin is positioned as a flavor enhancer and modifier rather than as a sweetener, says Roger Huss, new products manager at Tate & Lyle. Non-cariogenic, Thalin is GRAS in chewing gum and the supplier is seeking GRAS extension for other food and feed applications.

Sweeter future?

A lengthening roster of non-caloric sweeteners is waiting in the wings for further R&D or regulatory clearance to compete with caloric sweeteners and aspartame. If and when they become available, of course, is anybody's guess. Here's a rundown on the most significant:

- Cyclamate, 30 times sweeter than sucrose, was banned after several years of use in 1970 by FDA for suspected carcinogenicity but has been cleared of that charge (*FE* Aug., '84, Nov., '85). Manufacturer Abbott Laboratories and the Calorie Control Council (CCC) have jointly petitioned for reapproval.
- Acesulfame K, a non-metabolizable organic salt 200 times sweeter than sucrose, was discovered in Germany and developed here by American Hoescht Co. Approved in many countries, "it has potential for use in all areas where sweeteners are now used," says the CCC. A petition is pending here.
- Sucralose, a sucrose chloroderivative reportedly 600 times sweeter than sucrose, is made by altering the sucrose molecule.

Johnson & Johnson Co. petitioned FDA for clearance on Feb. 12 of this year. According to the CCC, several other chloro-sucrose derivatives ranging from 5 to 2,000 times sweeter than sugar have been developed but await long-term toxicity tests.

- Alitame, a low-calorie dipeptide of the amino acids L-aspartic and D-alanine, reportedly has a taste similar to sucrose but is 2,000 times sweeter. A petition is pending at FDA, but Alitame is not cleared anywhere.
- L-sugars, the so-called "left-handed sugars" with molecular structures the reverse or "mirror image" of common sugars, are non-metabolizable and have no aftertaste.

Lev-O-Cal Co., formed by Biospherics Inc. (Rockville, MD) and two Italian partners (Monted[illegible]n and Ferruzzi Group, the latter accounting for 15 percent of EC sugar production), has developed L-glucose and L-fructose and hopes to gain regulatory approval by the early 1990s. Manufacturing cost for L-glucose is now under $1.00 per lb. but is not yet economical for L-fructose, says Lev-O-Cal.

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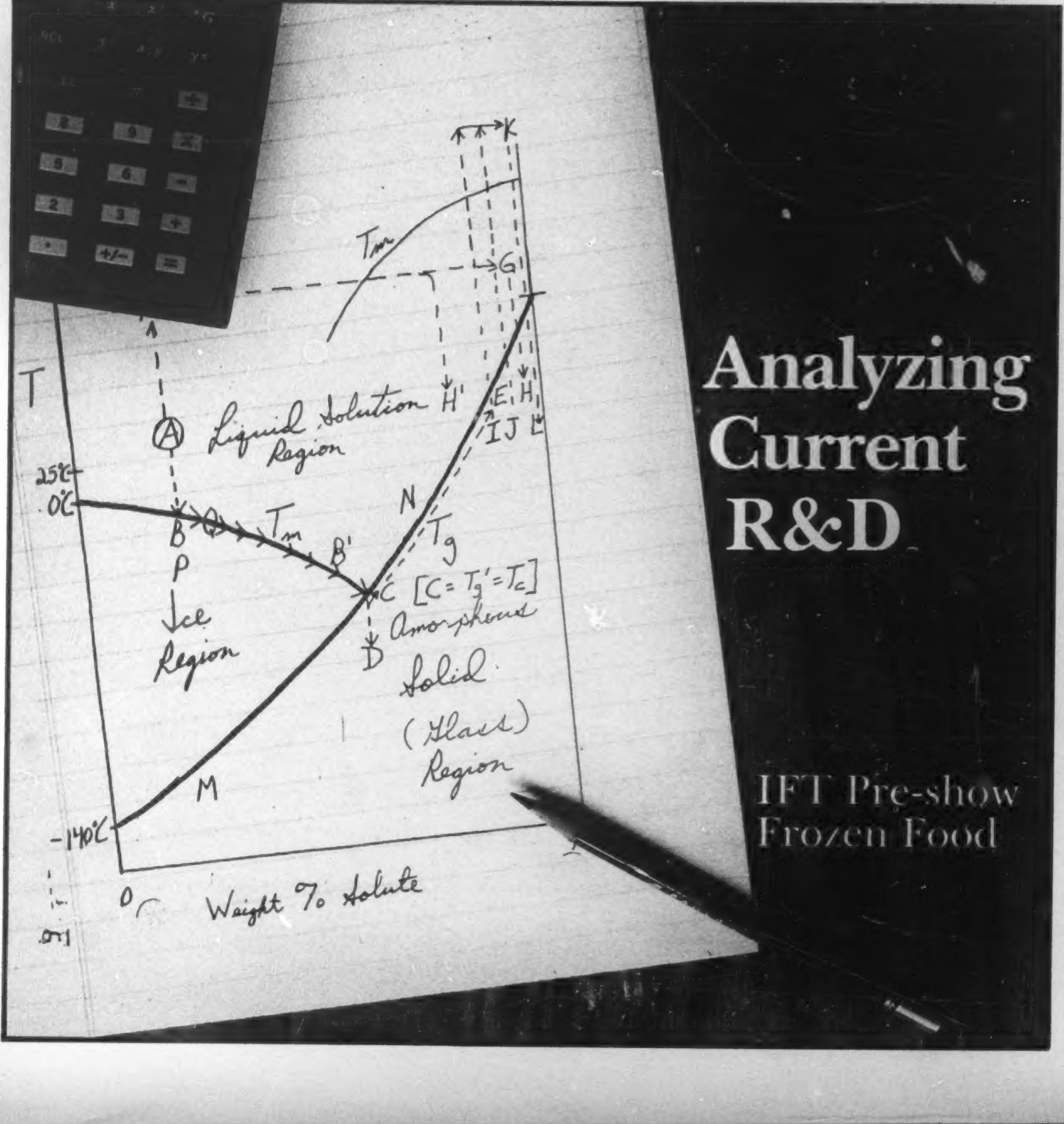
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COVER STORY
Success in today's marketplace requires a new relationship between top management and the research and development team. State diagram courtesy of Drs. Harry Levine and Louise Slade, Nabisco Brands, Inc.

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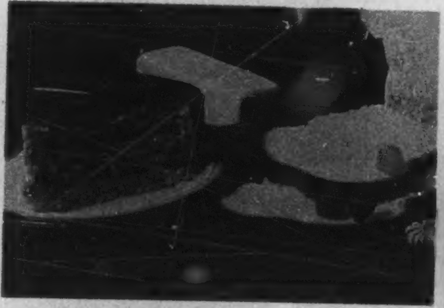

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182 Interfacing a PC to your existing laboratory equipment.
184 Fire forced processor to improve solids blending operation.

COMPUTERIZED CODER: PAGE 173

Special Emphasis

VEGETABLE PROTEIN USE SHIFTS GEARS

The emphasis in the vegetable protein market has shifted radically in the past few years from nutrition to function.

Pages 155 to 162

Food & beverage imports up 10.4%: A growing problem for America

Product	(million lbs.) 1985	1986	% Change
Confectionery (except chocolate)	755.0	851.2	+12.7
Chocolate (sweetened candy)	196.1	195.5	- 0.3
Cheese, all kinds	298.0	281.3	- 5.6
Pasta (macaroni/noodles)	185.0	190.7	+ 3.1
Breakfast cereals	34.4	35.5	+ 3.2
Fruit jams/jellies/marmalades	82.2	99.1	+20.6
Biscuits/cakes/breads	319.7	355.5	+11.2
Meats, all kinds	2519.4	2561.8	+ 1.7
Fish, all kinds	2632.3	2811.2	+ 6.8
Fruits & nuts (fresh/dry)	8634.2	8745.8	+ 1.3
Vegetables (frozen/fresh/dry)	2824.9	3009.7	+ 6.5
Coffee (crude/roasted/ground)	2505.5	2611.6	+ 4.2
Tea (crude/prepared)	175.1	198.6	+13.4
Fruit juices (mil. gal.)	755.4	1032.0	+36.6
Mineral waters (mil. gal.)	29.8	30.8	+ 3.4
Wines/champagne (mil. gal.)	134.1	102.3	-23.7
Beer/ale/stout (mil. gal.)	246.3	274.8	+11.6
Distilled spirits (mil. gal.)	122.3	106.4	-13.0

Most imported food categories showed gains in 1986 over 1985, with fruit juices, jams/jellies and non-chocolate confectionery products leading the way. Wines and distilled spirits were the only significant drops.

According to figures recently released by the U.S. Department of Commerce, slightly over $23 billion worth of food and beverage products were imported into the U.S. in 1986. This is an increase of 10.4% over the $20.93 billion imported in 1985. These dollar amounts reflect customs import values for all foodstuffs (crude and prepared), excluding live animals and feed stuffs for live animals.

A list of specific categories, (see accompanying chart), shows some interesting changes in the past year. Jams/jellies and the non-chocolate confectionery categories were up sharply, reflecting a world sugar price of about one-third the U.S. price, according to the National Confectioners Association. Due to increased apple juice imports, fruit juices showed a significant gain. Wine imports were down sharply, which the California-based Wine Institute attributes the decline to the lower U.S. dollar making imported wines more expensive. Beer imports were up, reflecting increased domestic sales. Pasta imports were up slightly in spite of high retaliatory import duties which were in effect for eight months in 1986.

Foreign competition

There is growing concern around the industry about foreign competition. Since the early 1970's, food imports have tripled. American consumer demands for quality and convenience have opened the door to imported value-added products.

Pointing to the 12.5% market share in the prepared soup segment that Ramen noodles has achieved Herbert Baum, president of Campbell U.S.A., says that the Japanese are a growing threat to the American food industry. Baum says that American processors need to pre-empt the Japanese by introducing innovative new products and packages while keeping costs down. Baum suggests extending product lines and improving existing brands as a method.

Foreign successes in new technological areas, such as aseptics and controlled atmosphere packaging, allows them to bring experience in these techniques to the U.S. marketplace. These technologies are specifically applicable to value-added products. The Japanese and Europeans have leaped ahead of the U.S. in technological developments because of their willingness to bring new technology to the marketplace. Faced with high long-term research costs and lengthy government approval processes, U.S. research tends to be applied, rather than basic, geared to short-term market victories, rather than long-term product alternatives.

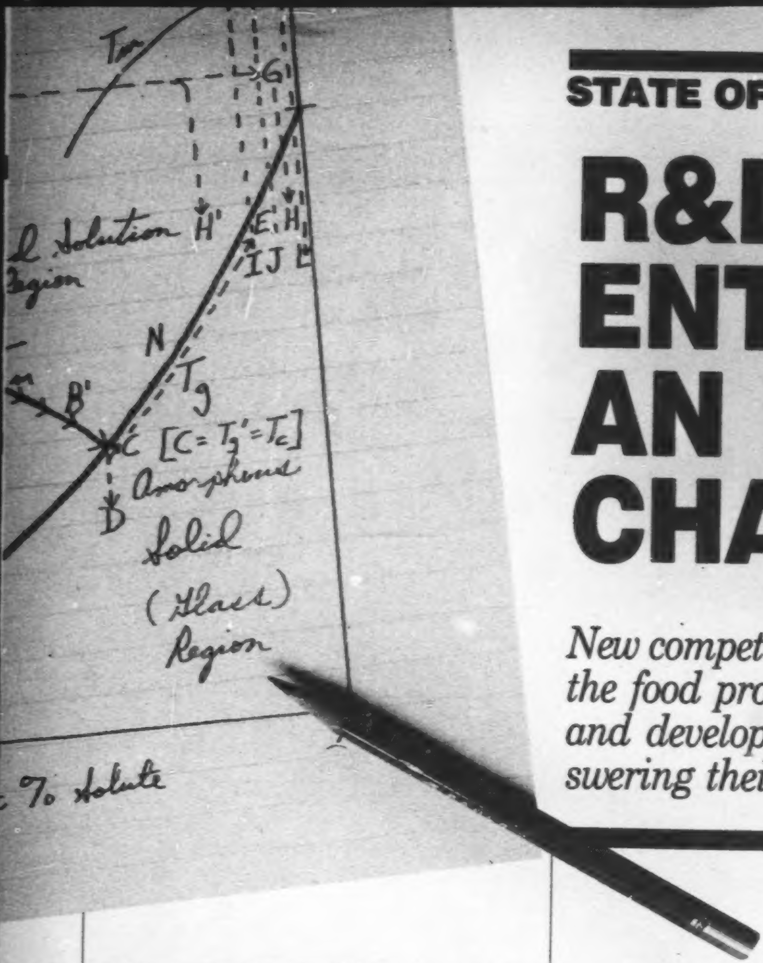
Quality of imported foods?

Meanwhile, the FDA is concerned about the quality of imported foods. At the National Food Policy Conference held in Washington, FDA Commissioner Frank Young stated, "I am very concerned about the quality of some of our imported foods. We have to ensure—as much as we can—that imported food really has the same degree of safety as domestic. I can tell you that's not true now." In the past, raw materials were brought into the country and the food was processed here with FDA inspectors providing a "good layer of safety" via in-plant inspections. Today, FDA inspectors can check at most, 9% of the estimated 1.4 million entries per year.

Taken together, continued growth of food imports, foreign concentration on value-added products via application of high technology, and FDA concerns over quality of imported food products add up to a growing problem for the American food industry.

Food consultants to present survey results

During the IFT Expo in Las Vegas, on Wednesday, June 17, at 10:00 a.m., *Prevention* Magazine and the Rodale Food Consultants will hold a news conference featuring the results from the 1987 Prevention Index. This is an annual survey of the nation's health habits conducted for Rodale Press by Louis Harris & Associates. This year's survey includes information on high-fiber foods, low cholesterol/low fat foods and low calorie foods.



STATE OF R&D

R&D: ENTERING AN ERA OF CHALLENGE

New competitors have changed the nature of the food processing business. It is research and development that holds the key to answering their challenge.

In a new era of competitiveness – not simply among U.S. food processors themselves, but with foreign competition, institutional markets and in-store food merchandising – do U.S. food processors have enough of a commitment to research and development?

The name of the game in today's marketplace is convenience. In a speech given at the FoodPlas Conference in Orlando, Herbert Baum, president of Campbell's Soup stressed that today's consumer wants convenience, quality and safety, but most of all, convenience. And consumers are willing to pay for this convenience. The consumer wants to spend as little time as possible in meal preparation, and so will spend a little more money for a restaurant-prepared meal, or spend a little more money for a take-out prepared meal, or spend a little more money for a store-bought meal requiring little or no preparation.

This all translates into a ready market for more value-added products. And, let's face it, value-added is where the profits are. This is why foreign companies have seized the opportunity presented by new processing and packaging technologies to grab an increasing share of the American market. For the first time, the U.S. has become a net importer of processed food products. (See *FE* Jan. '87 p. 76, "Grappling with a Global Economy.")

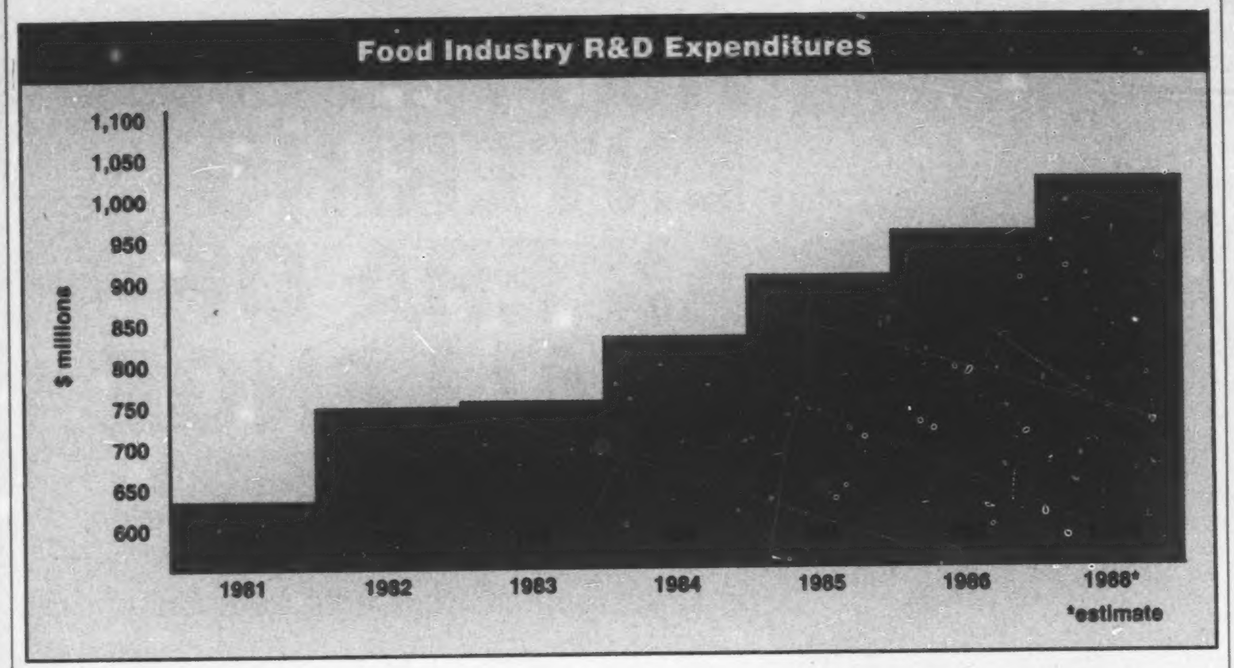
WILLIAM C. DRENNAN
Senior Editor

This is why restaurants are exploiting the possibilities presented by controlled atmosphere techniques to batch prepare their high quality meals and sell them in other venues. And indeed, restaurants/institutions have captured a whopping 47% of the consumer food dollar. This is why supermarkets themselves have become food preparation centers with expanded delis that include numerous items for take-out, offering everything from sliced bologna to prepared shrimp and fried chicken.

Where does Research and Development fit in? It is through R&D efforts that new products and techniques arise.

According to Al Clausi, senior vice president and chief research officer for General Foods, research and development efforts are aimed at freshness, quality, naturalness, nutrition, packaging and segmentation. Those are the top priorities that are being reflected in today's marketplace and by today's product development. "Different seg-

(Continued on page 92)


Food Industry R&D Expenditures

While budgets have risen steadily over the years, less than 1% of sales is generally allocated for research and development by food manufacturers.

ments of people want products tailored to their interest," said Clausi. "And they're willing to pay the price for it."

The product is no longer driving the market... the market is driving the product. Production-driven American food companies who are offering a good product, trying to compete on a cost basis are slowly being left behind. The rules of the marketplace are changing. The competition is as much or more with the restaurant/take-out business as with other domestic food companies—and as much with foreign competitors as with domestic ones.

The drive for market-driven products is reflected in private laboratories, such as the NFPA National Food Labs (NFL) in Dublin, California, which play an important role in supplementing applied research. According to NFL President David Holmes, "The kinds of work we do at National Food Labs are really driven by short term marketing. Larger food corporations have their own basic research centers doing long term research. When they get an overflow in an area, they send out for consultants like ourselves to give them a hand and it's always short term. They define projects very specifically with a definite time frame to keep costs in control."

General Foods does basic research and a lot of applied research. "There's always a lot of applied research going on," said Clausi. "Some of our research is contracted out, but that's really a minor portion."

Impact of mergers on R&D

The emergence of the conglomerate as a result of merger activity has had a profound effect on R&D. Although acquiring firms may be half a struggle, dealing with the debt service required with a multibillion dollar acquisition, it is possible that the acquired companies may find themselves with infusions of technical funds and talent. For some companies, mergers could provide the opportunity to revitalize technical programs that have stagnated due to lack of funds. While details vary across the industry, the most dramatic shift is the increased emphasis on new product development, marketing research, packaging and labeling, as a result of primary objectives being focused on short term financial performance. Expenditures on more basic research probably constitute a declining percentage of R&D budgets as the bulk of expenditures tends to be more sharply focused on immediate problems. In the long run, this trend may prove costly. Unique new competitive products will increasingly require basic research information from the biotechnology fields which could hold the key to new and less expensive production techniques.

With research and development and technology being increasingly integrated with marketing and sales in larger corporations, new products are likely to be more market-driven. R&D will be drawn closer to top management via centralized planning. Favorable budgets for R&D are likely as long as the research output is clearly valuable to the financial performance oriented conglomerate. Historically, larger companies spend larger percentages of sales on R&D. If this trend continues, the emerging giant conglomerates should fuel expanding nationwide R&D programs.

With mergers involving conglomerates there are opportunities for in-house collaboration on joint research efforts now frequently performed between staffs of food processors and various suppliers to solve specific technical problems. Public and private university research will continue to fill an important niche, particularly in supplying much of the fundamental research on which applications can be based.

Al Clausi of General Foods thinks that rather than dampening R&D efforts, mergers are helping them. As far as basic and applied across the industry, Clausi's impression is that considering the concentration in larger companies, there is *more* basic research going on amongst his competitors than before.

"But it's going to be a while before that result is evidenced in the marketplace," said Clausi. "And it's going to require a change of mentality on the part of management of some food conglomerates before results get used." Clausi does not see mergers themselves as an anathema to research. "I think that the only mergers that are a problem for research is when these raiders get involved. They only want to turn the business over to someone else to run it at a profit for them. They cut research, trim overhead."

Research needs

What research programs are most important? The Institute of Food Technologists has attempted to identify the most pressing research needs through the 1990's. Improved productivity in food processing, increased knowledge of nutrition and enhanced safety of foods were considered primary research targets.

Within these parameters, the IFT identified the following as research priorities:

•1. Developing innovative technologies, especially through biotechnology, sensors and robotic controls, as a means of improving food processing systems. These innovations should aim to assure cost reductions, decrease waste losses and provide a better technical capability to enhance the U.S. position in international trade. Designating these as top priorities derives from the need to preserve current markets, enhance nutrition and health, strengthen future regulatory positions and foster exports, as well as tap the applied research potential of available science.

•2. Developing technologies to improve agricultural and food products. Research combining genetic engineering and plant/animal husbandry may permit quality improvements in both the palatability and nutritive values of foods. Research is needed to discern the factors which motivate people in food selection. Linked with this is need to develop knowledge of the effects of certain food components on specific physical and mental functions.

Among the benefits expected from this research is a clarification of the effects of the constituents of foods on selected groups of people, for example; individuals with allergic reactions.

•3. Increasing the understanding of the physical, chemical and biological properties of food. There is a need for a long-term strengthening of the food industry's scientific base—specifically, an expansion of basic research which would make it possible to control the properties of materials in process as well as those of finished foods. Comprehensive understanding of the properties and structures of food materials could provide the processor with a potential catalog of properties that can be transformed into both food values and controllable variables. This, in turn, could lead to both increased productivity and the manufacture of better food products.

•4. Developing innovative analytical procedures that are rapid, nondestructive, simple, continuous/automated, on-line and inexpensive. Beyond achieving speed and accuracy, improved analytical methods would permit more effective nutrition intervention by controlling nutritional variances during processing. Research to develop improved analytical methods should also be directed to discovering means to extend food safety practices to biotechnology through characterization and evaluation of newly installed genetic engineering practices. New analytical tools are also needed to certify the effectiveness of detoxification techniques.

•5. Understanding the mechanisms for controlling biological activity to enhance food safety. Research is needed to improve the knowledge of actual exposure and true risk to show the real (as opposed to hypothesized) health threat from food components. Investigations which link enzymology to food composition should lead to improved

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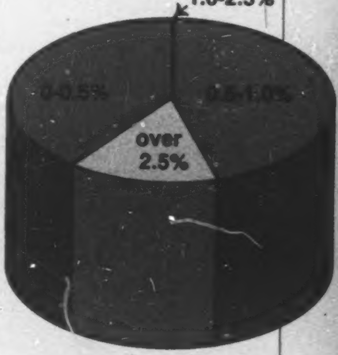
What is your R&D budget as a percent of sales?



More than three-fourths of our survey respondents said that their companies spent one percent of sales or less on R&D.

foods, better yields and safer foods. Research directed at reduced wastes and the conservation of process materials stem from environmental concerns. Expanded research on biosynthesis of preservatives and flavorants could result in useful products, broadening the potential of genetic engineering within the food industry.

•6. Obtaining and evaluating critical data related to health/nutrition and safety. Various factors influence the food choices of consumers. These can be translated into important production and marketing decisions within the industry. Consumer decisions, along with general food and nutrition knowledge, can have a substantial impact on the nation's health status in the long term. Research and interpretive studies are needed to clarify the role of food components in health and to measure risks to individuals with diet-related diseases.

The IFT has called for increased investment in food science which would help reduce the negative impact of food imports on the balance of trade, while enhancing the opportunity for exports.

Foreign competition

The U.S. has become a net importer of processed foods. Why has this happened? Are foreign companies outperforming the U.S. in areas of basic research?

Mr. Clausi's feelings about foreign competition are comparable to those voiced about other industries feeling pressure from foreign invasions. "It's not so much that they're doing more basic research than we are," said Clausi. "Or for that matter even more applied than we are, but they're using it in the marketplace more aggressively than we are. We have in this country far more capacity and capability to act in the marketplace than we seem to be willing to do. My concern is that we'll be seeing products and technologies that are 5 or 10 years old in this country coming in via foreign manufacturers... not because they invented it necessarily, but because they're using it."

Why is this happening? It may be because foreign companies are hungry for new business and not worried as we are about offending the old. Companies with big products that are generating a lot of sales, even though those sales may be decreasing, are preoccupied with maintaining market shares, rather than nurturing new competing products alongside of it. Clausi likened the situation to being preoccupied with a slow-moving elephant, while ignoring a speedy, growing mouse. "Trying to get that elephant's momentum up can be a Herculean task."

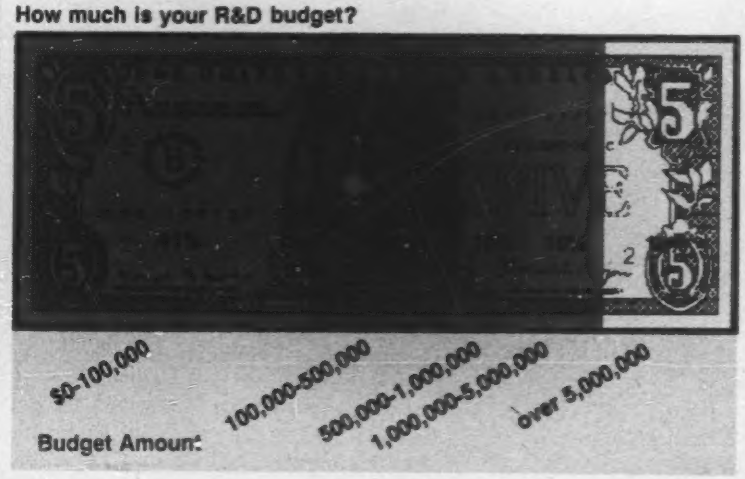
"The one area where I would say foreign aggressiveness is already very evident is in packaging," said Clausi. "They are country miles ahead of us in some of their innovative packaging. And it's not that they know more than we do, they're just using it."

Use of private labs

The National Food Laboratory is primarily used for applied research on a confidential basis. Unlike universities private labs have stable staffs and can limit access. "We are a confidential and very proprietary lab," said Holmes. "And we are sought out because of that reason."

When asked about research trends, Dr. Holmes said he sees a trend in the food industry towards fresher, refrigerated and frozen foods. "All kinds of work is being done on new types of packages... do they make the product look, appeal and taste better?" Food safety is another issue addressed by NFL—both in packages and in the food itself. Foods are in the marketplace in different distribution channels that weren't there before. "They're putting dairy products in plastic wrappers. There is a lot of reformulation going on to be compatible with microwave, retorts and aseptics." NFL does a lot of work with the microbiological safety of all of the above, e.g. a company will ask the NFL to evaluate a new package from the microbiological standpoint, or question whether changing the atmosphere could cause a worry about staff, salmonella or botulism? NFL will challenge the system by physical inoculation and so forth."

How much is your R&D budget?



While 62% of our survey respondents spent less than $500,000 on R&D, a healthy 18% budgeted over $5 million.

Holmes said that over the long haul there

(Continued on page 96)

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has been quite a bit of trimming back of R&D. He says that acquisitions and divestitures have brought this about. When asked about foreign competition, Holmes said that, "Foreigners seem to stimulate us in new products. We seem to be inhibited by our regulatory system in the U.S. NFL receives projects for getting systems or products through the regulations."

Response to consumers

The primary function of research in food companies is for new product development. In the search for larger market share, new product introductions are proceeding at a frenzied pace. In 1986 alone, there were 3,389 new product introductions in the U.S. (see *FE*, April p. 61). These new products are being offered primarily in response to consumer concerns and interests, including:

- Convenience. Microwave oven and toaster oven applications are growing ever larger. According to the latest SAMI figures, 60% of American households now have microwave ovens. Products designed for microwave cooking can require quite different formulations than for conventional cooking techniques.

The greatest reflection of consumer demand for convenience is in the area of packaging. Single-serving sizes, shelf stable packaging, aseptic processing and packaging, retortable flexible pouches and dual-ovenable containers are all direct responses to consumer demands for convenience.

- Freshness. Consumers are demanding freshness in their products. That is one reason they are turning to restaurants and "take-out" stores. The implications arising from this demand include shelf-life extensions for fresh foods, a closer-to-fresh processed foods approach, and closer-to-market food production and preparation. In response, the food industry is exploring improved thermal processing techniques and controlled atmosphere packaging and transportation to hold product freshness. The explosion of new refrigerated items (see *FE* April, p. 76) is also in response to a demand for freshness.

- Quality. Consumers are demanding and are willing to pay for higher perceived quality. This demand is focusing attention on improved flavoring systems, the use of natural colors and flavors and improved crispness in some microwaveable products. Work in flavor encapsulation and natural flavor production through tissue culture and fermentation are responses to this demand. As is work with susceptors in microwave packages to focus energy in places where crispness is desired.

- Safety. Food safety is a broad issue, encompassing formulation, processing and handling, all the way to packaging and in-store handling. Recent major incidences of *Listeria* and *Salmonella* involving 12 deaths in this country have focused attention on greater regulatory control which involves the development of improved testing procedures. In the packaging arena, 1,720 food tampering reports in 1986, (See *FE* Feb. p. 67) have forced companies to develop improved tamper evident containers.

- Nutrition and Health. Additives, fiber research and the use of physical instead of chemical preservation methods are responses to consumer interest in healthier products. Nutritional research into the areas of amino acids and fatty acids also addresses this issue.

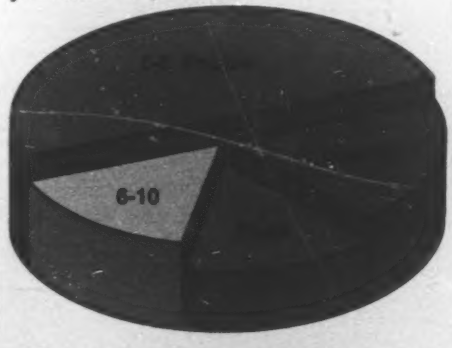
- Value. Increased expenditures for out-of-home eating does not imply that consumers are not still value-conscious. Research into cost reduction, waste reduction, by-product utilization and reduced packaging costs are all aimed at giving consumers more value.

Areas of opportunity in R&D

According to James J. Albrecht, vice president and general manager of McCormick-Stange Flavor Div., there are several key technological areas receiving the attention of R&D efforts.

- Biotechnology. This includes enzymology, protein engineering and fermentation technology. The production of natural flavors (and possibly natural colors) through fermentation and enzymatic techniques is just on the horizon.
- Packaging. Packaging systems for microwaveable products, aseptic packaging of particulate food products and controlled atmosphere packaging techniques are receiving a lot of attention.

How many people staff your R&D Department?



Two-thirds of our responding companies have R&D staffs of 10 or fewer people. 18% reported over 20 people working on R&D.

- Fabricated Foods. Given the techniques used for surimi manufacture and the subsequent structured or fabricated seafood products involving the use of surimi, it is likely there will be a resurgence of work done on textured meat and poultry products using similar fabrication systems.
- Nutrition and Health. Consumers are looking for more than taste and convenience.

General Foods agrees with Albrecht's list. "We're very much involved in basic areas such as new preservation methods, biotechnology, nutrition and health, and sensory perception," said Clausi. "These are kind of underpinnings of research that you need for any successful food venture."

℞ for R&D success

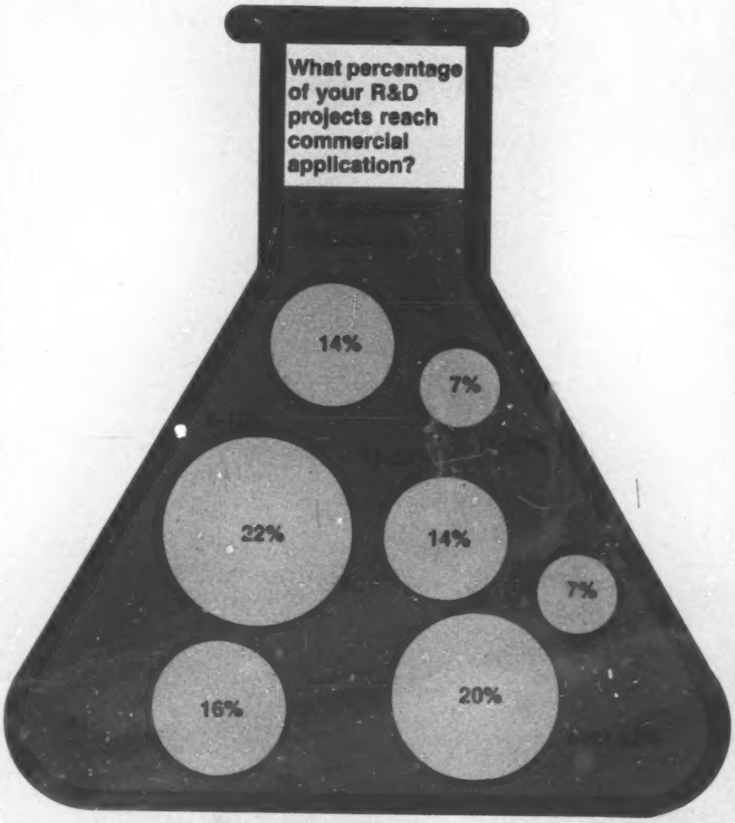
According to National Food Processors Association President, Fernando Gumucio, who also serves as the President of Del Monte, U.S.A. as well as vice president of Nabisco Brands U.S.A., success in today's marketplace will require a new relationship between top management and R&D. Gumucio stressed that, "Within the new corporate structures which have evolved, the need for creativity and entrepreneurship has never been more pronounced, given the fiercely competitive nature of the industry."

In order to compete effectively with innovations from abroad, Gumucio says that fundamental changes must take place within the U.S. corporate structure as follows:

- There must be closer interaction between R&D and top management. Those in R&D must know the economics and strategies of the business. Top management must have a better appreciation of the company's R&D capabilities;
- All managers must become more tactical, placing more emphasis on "hands-on" experience and execution and paying a premium for real talent;
- Much more senior or experienced, focused people must become involved in brand management.

Making the picture more complicated is the increasingly fragmented consumer market. "There will be a constant ebb and flow in consumer desires and demands as the so-called baby-boomers hurtle toward their mid-life crises and beyond," said Gumucio. He added that meeting consumer and trade demands will "be like dancing through a mine field."

"Therefore, in an environment of 'company business' on one hand and a rapidly changing market on the other hand," concluded Gumucio, "here in America we have a need of the true entrepreneural spirit more than ever. The sheer joy of inventing, creating and the satisfaction of seeing your genius become a viable business is not a luxury—it will be a necessity."



14% of our respondents reported less than 5% of their projects reaching commercial application. 22% reported a 6-10% success rate. 7% claimed that 11-20% of their projects made it. Another 14% said 21-30% of their projects were successful. Another 7% reported a 31-40% rate of success. 16% claimed 41-50% reached the store shelves. And a full 20% said that 50% + of their projects reached commercial application.

R&D Survey

As part of this report, *Food Engineering* surveyed R&D leaders in the food industry. Questions were asked about R&D budgets, staff sizes, the effect of mergers on R&D efforts and about R&D commitments. The information gathered is presented in charts throughout this article.

It is interesting to note that in response to our question about "Commitment to R&D," respondees rated their own companies lowest, below U.S. commitment and foreign commitment. It is apparent that on the average, research and development managers feel that not enough research efforts are being made by U.S. food companies.

Some of the comments we received include:

> "R&D is in a general decline in the U.S. because of the length of time needed to develop a truly new product and the lack of lead time in the marketplace before it can be copied or duplicated."

(Continued on page 101)

"Cost consciousness has reduced R&D efforts in the U.S. due to their expense."

"U.S. food industry takes very little advantage of the vast technical knowledge available and like most U.S. businesses is run by financial people who refuse to believe that food R&D professionals have business sense."

"I think that American food companies are just now beginning to realize that they can no longer rest on their laurels and must compete on an international scale."

"R&D in the U.S. has been neglected. However, companies are now realizing the effectiveness of R&D, not only in developing new products in a laboratory, but as a support for sales. There is also a great deal of pressure on R&D staffs to produce products giving a competitive edge to their company.

"In the early 1980's, R&D was a 'me too' type of format with duplication of competitive products as the main focal point. This stagnates the development of new products. We have now moved into an era where creative R&D is used for the aforementioned competitive edge."

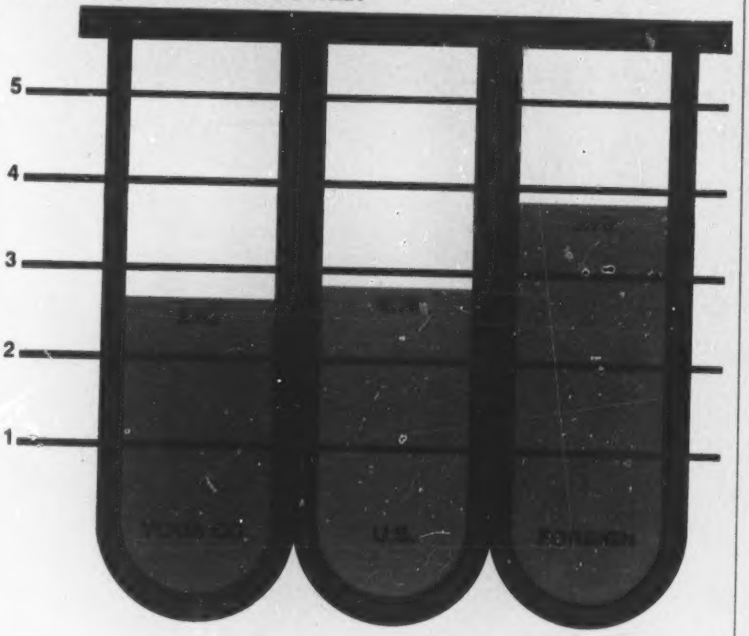
"Along with innovation, the food producers must be concerned with nutrition which was never seriously considered in the past."

"I feel that foreign R&D is currently moving in the areas surrounding the actual food product (i.e. packaging)."

"I think R&D is one of the major components of a growing and thriving company—one that can keep up with its competition. In general, I think R&D's status in the U.S. is increasing because of this. However, I think it has a way to go before most companies' stop thinking of it as a dollar burner."

"In some areas, U.S. R&D is 10 years behind Europe and Japan—packaging technology for example. U.S. R&D has been seriously underfunded the past 10-20 years because of the influence of financially-oriented CEO's who have trouble seeing be-

On a scale of 1 (low) to 5 (high), please rank the following: Your company's commitment to R&D; U.S. commitment to R&D; and Foreign commitment to R&D.



Respondents generally ranked their own companies lowest for "Commitment to R&D," slightly below the overall U.S. commitment and substantially below their perception of foreign commitment.

Effect of mergers

As described earlier, there has definitely been an effect of food industry consolidation on research and development. How do our survey respondents feel about it?

"In the short term, mergers result in people losing their jobs because of consolidation of R&D labs. Long term, there will probably be more jobs because of the stronger companies that result."

"Mergers have reduced creativity and rate of R&D."

"Mergers and conglomeration has reduced R&D for long range status of R&D in U.S. – stinks."

"Mergers, especially leveraged buyouts are detrimental to R&D. The payback becomes the overriding priority."

"Merger activity, depending on primary products causes reduction in to-

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tal R&D personnel and decreased budgets (due to staff cutbacks). However, cross fertilization of retained employees and skills increases efficiency and provides for a greater percentage of 'hits.'"

"Merger activity has stifled R&D. The money is going to "earnings per share" to fend off the merger maniacs."

"I think mergers could help R&D dollarwise – more availability. They could also split up some good teams which scares me."

"Mergers have a negative effect. The tendency is to 'buy tech' rather than develop it."

"Friends in the industry who work for corporate giants usually find it difficult to maintain R&D programs for some time after a merger has taken place."

Wish lists

As always with our surveys, we asked our respondents for their "wish list." If suddenly given access to unlimited funding, what projects would they establish?

"Continuous agitating retort systems for glass"

"Application of robotics to food processing"

"Microwave processing of hard candy"

"A tasty, highly enriched bread product"

"Frozen entree product line for retail use."

"Commercialization of food irradiation."

"New techniques for preservation of food."

"Flavor additives such as cheese and caramel added to microwave popcorn."

"Improved packaging design for non-refrigerated, shelf stable cheese products."

"Radiation of fresh vegetable products."

"A full line of highest quality shelf-stable, dairy-based sauces, foods, etc."

"Food for space flight and into the 21st century."

"Computer application to flavor creation."

"In-depth study of causes of obesity and realistic means of prevention. Caloric intake and expenditure as currently preached cannot be the full answer."

"Determination, isolation and concentration of naturally occurring enzymes in meat that can be used for tenderization of less tender cuts."

"Effective alternative to frozen foods. Products with same quality and convenience but not frozen."

"I would seek to discover all that could be known about the effects of all-natural foods versus the 'processed' (and over-processed) versions, on the health of the consumer."

"Improvement in emulsion technology – automation to achieve uniformity in production and filling techniques."

Other survey results indicate that the bulk of companies have R&D staffs of 10 people or less, that most R&D projects never reach commercial application (although this does not mean that valuable information has not been gained), and that R&D budgets are generally onc percent of sales or less (see accompanying charts.)

Time to act!

It is clear that now is a time of both challenge and opportunity for American research and development. Some companies are already responding with new products, new processes and new packages. We have the facilities and we have the talent. In answering the challenge, food processors will be able to seize the opportunity to not only defend their U.S. markets, but also launch global marketing campaigns of their own.

GETTING FROZEN FOODS TO CONSUMERS

While obtaining shelf space in supermarkets is becoming more difficult, nowhere is the problem more acute than in the freezer section. But the situation is not hopeless.

[illegible] an- [illegible] aration by consumers.

Supermarkets depend on sales volume for profitability since fierce competition is keeping gross profit margins low. In 1985, after-tax profit for the industry was 1.19 percent of each consumer dollar, reports the Food Marketing Institute (FMI).

The heavy dependence on sales volume for profitability is resulting in inventory "turns," or replacements that average about 15 per year, reports FMI. So supermarkets are being more cautious in giving shelf space to new products. And slow-moving foods are being removed from the shelves.

Hence, it more difficult for food processors to get and keep shelf space for their products. Frozen foods are especially susceptible to being pulled from the shelf, or not getting space in the first place.

A major reason for the limited freezer space is energy costs. Supermarket energy costs often exceed those for rent. Refrigeration alone accounts for the major portion of a food store's energy bill—anywhere from 55 to 60 percent, according to FMI. And refrigerators and freezers must operate at all times—even when a store is closed—to prevent perishables from spoiling.

An escalating number of new food introductions each year is not helping the situation. Although, there is some slowing of frozen food introductions, due in part to the great proliferation of new products. Marketing Intelligence Services reports 94 new frozen foods in the first quarter of 1987 versus 121 for the same period in 1986.

ANN E. PRZYBYLA
Technical Editor

In spite of the cost to supermarkets to house frozen foods, it is an important area both in sales volume and profits. Frozen foods—available to the consumer in three categories: To be eaten frozen, thaw-and-serve, and heat-and-serve—account for an average of 10 percent of total food sales in the supermarket, according to the Eastern Frosted Foods Association (EFFA).

EFFA also reported that while profit per square foot of the entire supermarket is 1.28, it rises to an average of 8.61 for frozen food. And frozen foods led all food categories in increased sales for 1985, with a 5.5 percent rise (overall grocery sales were only up 4.7 percent, with most of that attributable to the increase of non-food items).

Annual sales of single frozen dishes—the frozen food department's largest product group—were $2.7 billion for 1986, continued EFFA. And new brands and line extensions of single frozen dishes were responsible for almost $450 million in sales, which is 16.5 percent or one in every six dollars spent—making the frozen food department one of the most innovative in supermarkets.

At the most recent National Frozen Food Convention, held last October in Las Vegas,

(Continued on page 148)

Interstate Food Processing Corp. first introduced its Quality Farms LetterBites to food service markets. The product's uniqueness have increased acceptance.

Byron Allumbaugh, chairman and CEO for Ralph's Grocery Co., Compton, CA, addressed the importance of frozen foods. He pointed out that in Ralph's, frozen foods account for 13 percent of grocery sales and 15 percent of grocery profits.

Ralph's began increasing the size of frozen food departments in its new stores about six years ago. As a result, its giant supermarkets now have more than 400 sq. ft. devoted to frozen foods.

Process starts early

Getting a new product into the freezer begins long before a manufacturer's sales force calls on supermarket buyers. A number of people polled agreed that there are several essential steps to successfully marketing a new frozen food. These are:

1) Do your homework to identify a consumer need – preferably one that is not already filled.

2) Build quality into the product.

3) Support the introduction with effective advertising.

4) Several people added – pray.

The classic example of a successful new frozen food is Stouffer's Lean Cuisine. In 1971, Stouffer noticed through its restaurants that lighter foods were in vogue. The company then spent ten years developing a quality product that tasted good.

A spokesperson for Stouffer pointed that quality will always win out in the long haul and if someone is able to produce a quality product at a lower price, then all the better.

Recently, Dreyer's Grand Ice Cream of Oakland, CA, introduced Dreyer's Grand Light – a 93 percent fat free frozen dessert developed to taste like regular ice cream. The important steps in developing a new product were followed. A task force – comprised of people from R&D, manufacturing, marketing, and sales – was formed to identify a need not being filled. Initially, it was decided that the company develop some type of low calorie/low fat frozen dessert.

Consumer research was then conducted to more closely define the product. Next R&D was given the assignment to develop the product with good taste the main objective. Although, they tried to keep the calorie content at 100 calories per serving, with some flavors it was necessary to go to 120 calories to get a product with a taste that consumers rated as excellent.

Once the product was developed, advertising was produced and simulated test markets conducted. Although, the company was convinced it had a truly unique product which consumers wanted, it was amazed at how much space was given to Dreyer's Light without any space being taken from Dreyer's regular line of premium ice cream.

"Demand for Dreyer's Light is three to four times what we expected and we haven't even begun television advertising," explains Susan Schultz, product manager for Dreyer's Light. The product is currently available in six western states. With expanded distribution planned, the demand can be met.

A correct assessment of consumers' needs is critical to successful marketing of new products. Geo. A. Hormel & Co. evaluated the tremendous changes that the American family has gone through during the past decade and how these changes have affected their eating habits prior to introducing its New Traditions line – developed specifically for microwave preparation.

The first products to be introduced in the line were Broiled & Browned Sausages which made their debut last year. The most recent additions to the line are Pre-broiled and Browned, Microwave-ready Dinner Meats (boneless, center-cut pork chops; skinless boneless breast of chicken; and fillet of catfish).

Since this line of meats answers shortcomings of microwaves offering consumers a convenience not previously available, Hormel's sales force had no difficulty creating excitement for the product among supermarket buyers, explained Gary Esbeck of Hormel. "Traditions Pre-broiled and browned Dinner Meats are so different, they draw attention," he continued.

Hormel began national roll out of New Traditions microwave-ready breakfast sandwiches last month. Other additions to the line will appear later this year.

Money...a necessary ingredient

Even with an exceptional new product that meets the criteria to be a winner, big money is necessary to launch it into distribution. Without this money – no matter how good a new product is – it will never become more than a speciality store item, explains Norman Schwartz, V.P. of Glacial Confections.

Schwartz speaks from experience. Glacial Confections, a Westport,CT-based company with 12 employees, recently introduced a new product which created a new category – Mousse du Jour frozen mousse. Based on a patented process, free water is bound in this product allowing it to be defrosted and refrozen without ice crystals forming.

Glacial Confections first needed to convince retailers that Mousse du Jour was indeed new and different from anything else available. But they also needed to have a program to generate consumers interest in this new category which included radio, TV, and print advertising. And that took big money.

Campbell USA President Herb Baum recently told an American Marketing Association conference on product introductions that a new product should be supported with a minimum of $15 million for marketing. This is a lot of money for a small company to come up with.

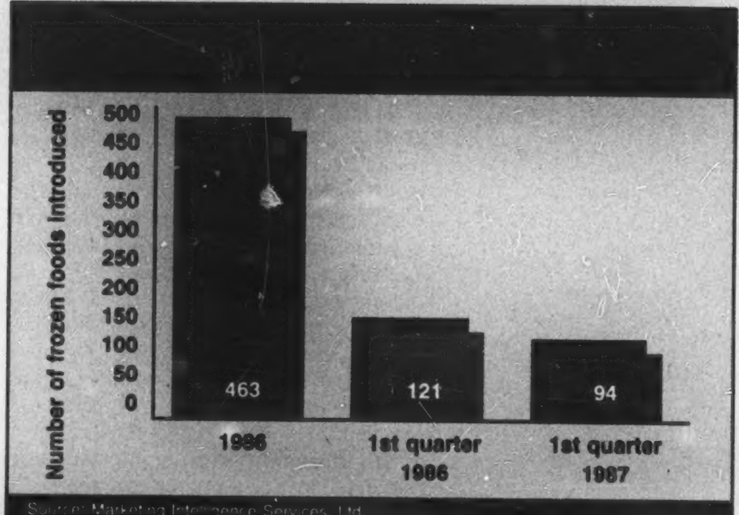
"You have to really believe in your product to invest this amount of money in it," said Schwartz. By obtaining investors to back Mousse du Jour, Glacial Confections did develop a major marketing program to support its product.

"We told retailers we were a small company but were willing to advertise as a large company," Schwartz continued.

This makes national introduction of a new product a long, uphill battle for small companies – especially when addressing the retail market. But some frozen food manufacturers are focusing in on food service and industrial markets.

D&K Frozen Foods, Walla Walla, WA, produces frozen vegetables for the industrial market. But they still need to keep up on current trends.

"We have ongoing programs to look for the kind of vegetables to be used in frozen entrees," states Gary Koehler, planning and purchasing manager for D&K. "Entree tailored vegetables have been a very fast growth area and we have been in the forefront because of our flexibility."



Source: Marketing Intelligence Services, Ltd

Dreyer's Grand Light

Above: Although fewer new frozen foods were introduced in the first quarter of 1986 than in the same period in 1985, freezer space for new frozen foods remains difficult to obtain.

Left: Dreyer's Grand Light obviously fills a consumer need since sales were three to four times predictions prior to television advertising.

Standard cuts of vegetables are dropping off, but the slack is being taken up by new types, explains Koehler. Appearance is currently an important consideration. Tiny, tender peas are now popular and edible pea pods are being sought.

Food service is another important area to frozen food manufacturers. For example, $19.8 billion of frozen foods, excluding ice cream was sold to the food service trade in 1986 as compared to $13.2 billion in 1985, reports EFFA. And Americans now spend 37 percent of their food dollar in restaurants, with 45 percent projected by the mid

(Continued on page 150)

1990s, EFFA continues. (Frozen foods account for most fish, chicken, meats, and vegetables used by restaurants).

Interstate Food Processing Corp. of Bosie, ID, decided to first introduce its Quality Farms LetterBites (patent pending) to food service markets. Although, limited freezer space of distributors is a problem in marketing frozen foods to food service customers.

LetterBites' uniqueness have helped in their acceptance. They are crispy, golden brown letters with a smooth potato interior. Currently used in school feeding programs, on children's menus in restaurants, and as finger food in bars, IFPC is now looking at retail markets.

Retail remains the ultimate market to capture. Before a new product is accepted by Stop & Shop Supermarket, Inc., a committee must approve it. Ed Dawe, frozen food buyer/merchandizer for Stop & Shop, listed the criteria by which a new food item is judged: Whether it's is a duplication; the product's sales potential; what the profitability will be; manufacturer's advertising program; whether the product fits a consumer need; if the product is in a growing category; and what introduction allowance (money offered to the retailer to handle the product) is offered.

Once a product is approved by Stop & Shop, it is given a slot at the warehouse and two cases are allocated per store. Promotions are then set up. New products are given six months and then reviewed to see if they meet the original requirements. Ones that don't are pulled from the shelf/freezer.

Categories and products are constantly reviewed at Stop & Shop. Based on these reviews, items are discontinued and categories are enlarged or decreased in size.

"We have many new categories in the freezer that didn't exist four or five years ago such as premium ice novelties, foods developed exclusively for microwave preparation, and toaster breakfast items. And since there is limited capacity in the frozen food section, existing items have to be discontinued to make room for new ones." Dawe said.

This makes it necessary for food manufacturers to continuously watch their existing lines in addition to developing marketing programs for new ones.

"We keep trying to create enough demand for our product line so retailers will feel they cannot discontinue any of our products to make room for others," explains Kelly Storms, marketing manager for Celantano Brothers Inc., Verona, NJ.

ConAgra Frozen Foods recently gave its Armour Dinner Classics—a frozen dinner line—a new look that includes new flavors, packaging, advertising, and a public relations campaign that emphasizes the quality and microwaveability of the dinners. This revamping was done as a result of consumer research showing interest in round plates

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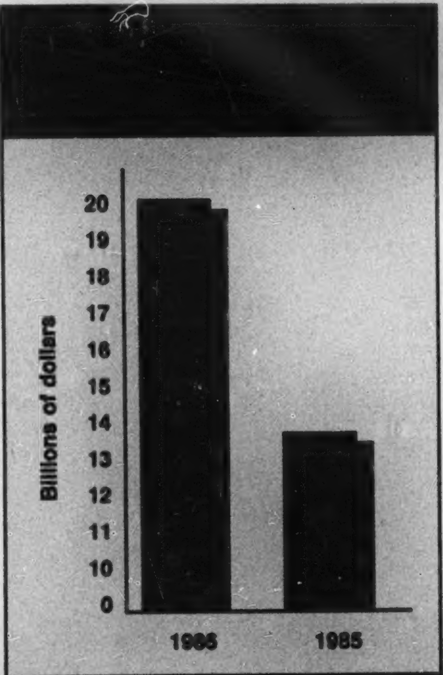
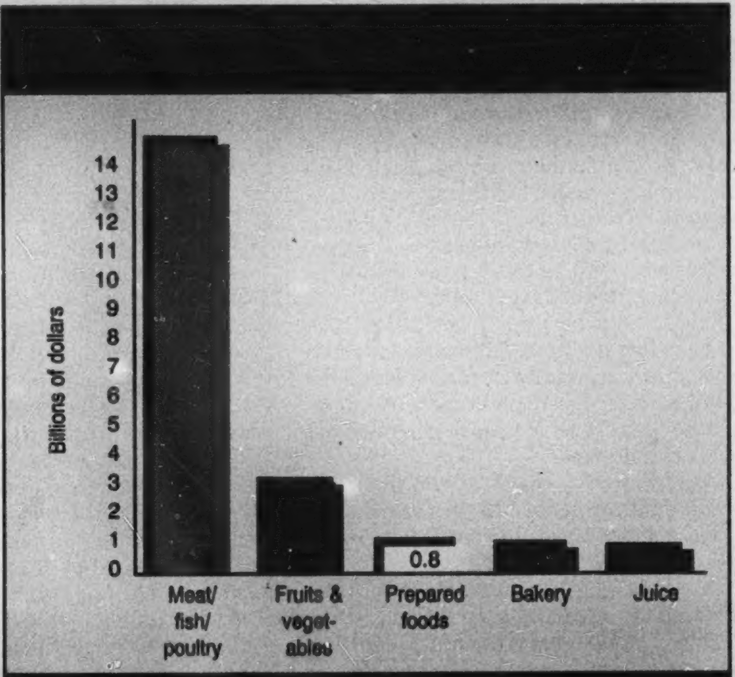


Source: Eastern Frozen Foods Association



Source: Eastern Frozen Foods Association

Insert 87 or see FEM, p. 169 →

for premium frozen dinners.

Selection of the new packages involved examining 100 different designed and narrowing those to 12. The 12 designs were then reviewed with consumers in a series of 12 focus groups around the country.

Results of the consumers testing showed that 93 percent of people recognized the "new" Dinner Classics, compared with the industry norm of 80 percent. And 25 percent said they definitely would buy "new" Dinner Classics, compared with a 12 percent purchase intent for "old" Dinner Classics and 14 percent for major competitors in the premium frozen food line, reports ConAgra.

More sophisticated tracking

The advent of the Universal Product Code (UPC) and computer-assisted checkout systems have allowed supermarkets to track the performance of individual products among other things. Scanning installations have gone from 444 in 1978 to 12,861 in 1985, reports FMI.

Another method retailers use to select which foods to carry is direct product profitability (DPP)—a measure of an individual items's actual profit contribution. While the concept of DPP has been recognized for more than 20 years, computerization has made it more efficient and more accurate. Also, increased competition in the industry has resulted in a growing interest in DPP.

DPP measures a product's adjusted gross margin to reflect such factors as deals and allowances, then identifies and measures costs that are directly attributable to the product, such as labor space, inventory, and transportation costs.

DPP not only assists the in space allocation for frozen food categories, but also directs to the profitability of individual items, Don Rix of Marsh Supermarkets told those in attendance at last October's National Frozen Food Convention. But he also pointed out that, "Manufacturers can help by assisting retailers in giving space to better products, keeping in mind that all in the industry are partners and need to work together to see the most profit."

New technology will continue to result in improved frozen foods and new categories within this area. And modern consumer lifestyles will keep the demand for convenient frozen foods high. All this makes it imperative that those products in the freezer shelves perform well.

As one manufacturer summed it up, "That means that companies better be producing products that consumers want."

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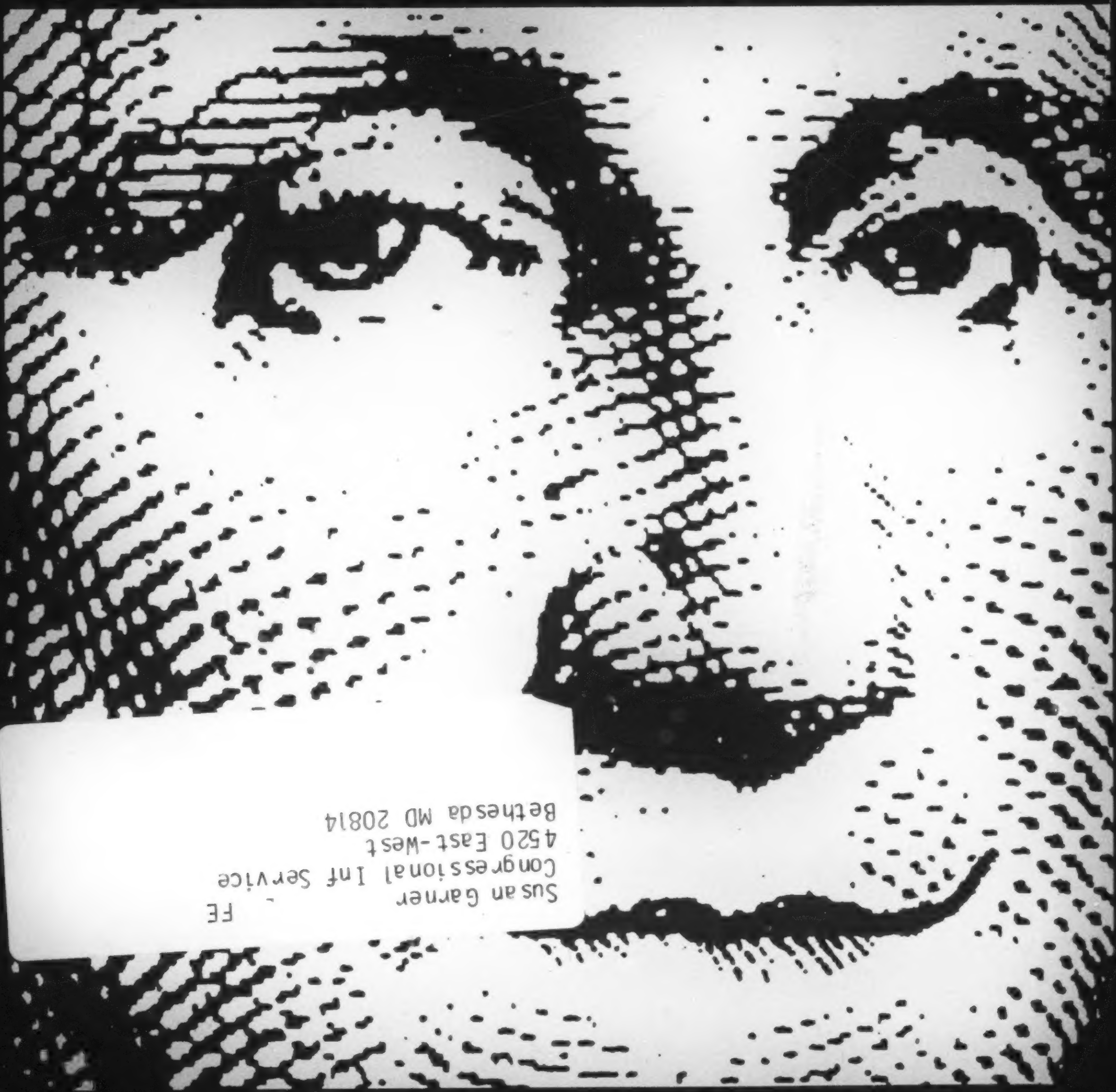

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ANNUAL STATE OF THE FOOD INDUSTRY

FOOD ENGINEERING

COVER STORY

Mega-mergers, along with strong stocks, are fueling a healthy industry, according to *Food Engineering's* annual report on the state of the food industry.

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This month's Report talks about major changes in Campbell's refrigerated product line; Procter & Gamble's request for FDA approval of the fat replacer, olestra; the continuing trend of mega-mergers; and a study of Americans' breakfast-eating habits.

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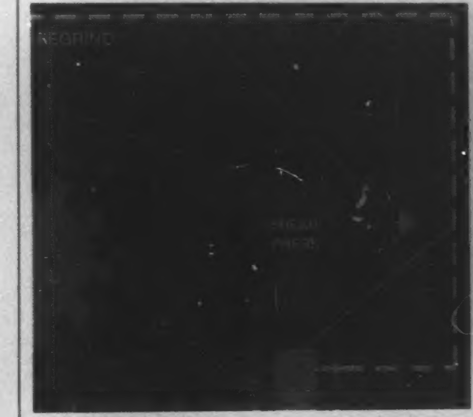

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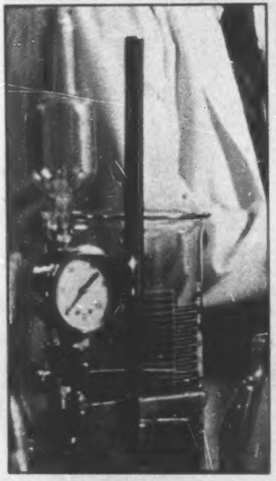

Special Emphasis

FOODS AND FLAVORS BENEFIT FROM TECHNOLOGICAL ADVANCES

Modern technologies are playing an increasingly significant role in the manufacture of today's foods.

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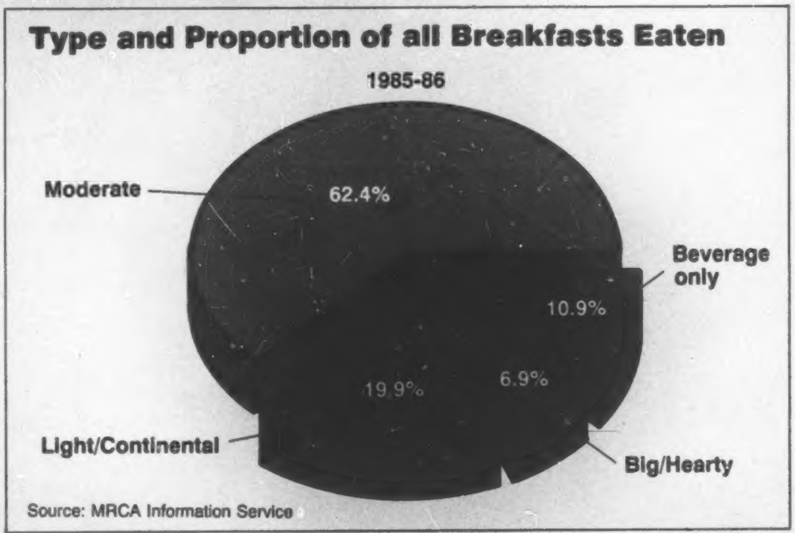
READ IT AND WIN AD CONTEST
For readers and advertisers
See pages 147 to 150.

Eating breakfast 'out' has become the 'in' thing



Source: MRCA Information Service

This chart shows the four most common types of breakfasts eaten by Americans in 1985-86 and the percentage of each type. Moderate breakfasts are eaten by over half of all Americans. And a growing number of people are eating breakfast out at fast food restaurants.

Americans are eating breakfast away from home more than ever. In fact, the number of people eating breakfast away from home has grown 23 percent since 1983, according to a study from MRCA Information Services, Stamford, CT. And the number of breakfasts eaten at fast food places rose 83 percent in the same time period.

Despite the rise in eating breakfast out, nearly 90 percent of all breakfasts are still eaten at home. And, contrary to popular belief, only 4 percent of Americans skip breakfast on a regular basis.

Today's busier lifestyles and the increased number of women in the workplace has started a trend towards simpler meals at home and an "eat and run" mentality outside the home.

Eating on the run

The study also found that consumption of nearly every "eat out" breakfast food category has increased since 1983. Breakfast sandwich consumption was up 37 percent; bakery/sweet goods up 12 percent; potatoes up 70 percent; and carbonated beverages up 88 percent.

Another trend, skipping breakfast, has also changed. On the rise in the late seventies to early eighties, the breakfast skipping trend reversed itself after 1983. Possible reasons for the reversal: consumers have become increasingly concerned with good nutrition—or the growing number of fast food breakfast options has made it too convenient not to skip breakfast.

The study also found that breakfast menus have changed considerably since 1983. Eggs are eaten 14 percent less, sandwiches 6 percent less and breakfast meats 7 percent less. On the other hand, consumption of fruit for breakfast is up 13 percent, instant breakfast/milkshakes up 19 percent and cereals up 2 percent.

Different Strokes

The region of the country consumers live in, as well as their income, accounted for preferences in types of breakfast foods. Light/continental breakfasts are popular in the Northeast, while big/hearty breakfasts are high on the list of people who live in the South. And beverage only breakfasts are eaten mostly by those with higher incomes.

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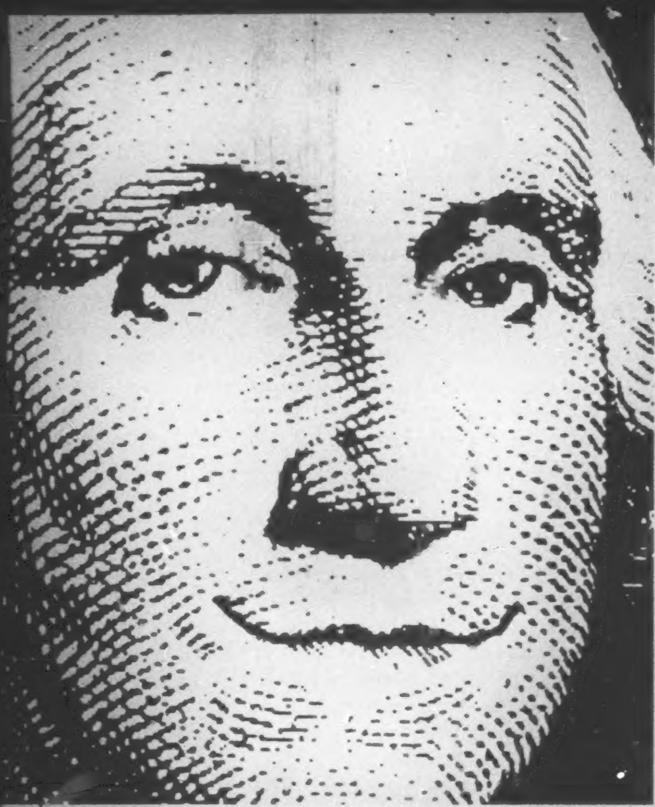

MERGERS FUEL A HEALTHY INDUSTRY

Finding and winning niche markets, developing new products to meet new demands, and restructuring for enhanced performance spell success for the processor.

When the computers finished crunching the numbers for 1986, the food industry looked back at the past 12 months with few regrets. It was a good year, a year in which the value of all food and beverage industry shipments showed a 1.4 percent increase over the previous year; a year in which 3,389 new products were introduced (an increase of 43.7 percent when compared with 1985). Merger and acquisition activity once again fueled an active food processing industry. Food stocks were strong and should remain so. But a disturbing question hangs in the air: Is the food industry really chasing new opportunities with new innovations or is it only chasing its own tail?

Product	1983	1984	1985	1986
Meat	$66,392	$68,579	$66,075	$67,898
Dairy	40,218	40,402	41,639	42,550
Preserved Fruits & Vegetables	31,313	34,058	36,186	36,348
Grain Mill (incl. breakfast foods)	33,250	34,377	35,078	35,754
Bakery	18,208	19,387	21,064	22,226
Sugar	6,042	6,149	6,234	6,285
Confectionery	10,401	11,279	11.927	12,410
Fats/Oils	17,073	19,551	20,977	21,918
Beverages	40,229	41,181	42,713	44,123
Seafood (fresh/canned)	5,627	5,281	5,017	5,343
Other	18,334	19,772	20,417	21,826
TOTAL	$287,087	$300,016	$307,327	$316,681

*Estimated
Source: U.S. Industrial Outlook 1987

Healthy sales increase

Across the 49 U.S. food processing industries, sales for 1986 were estimated by the Department of Commerce to be $316.6 billion. This represents a 3 percent increase from 1985 when sales were $307.3 billion.

Once again the food system continued to be the largest marketing system in the U.S. economy, responsible for one-tenth of U.S. employment and gross national product.

Food processors were able to reap the rewards of lower prices for many domestic farm commodities, paying, overall, to the country's farmers, about 5 percent less than they did in 1985 and 15 percent less than in 1984. It is estimated that prices of agricultural commodities have fallen 20 percent since 1980. The future doesn't look any brighter for agricultural commodities. Grain prices, for example, are forecast to weaken even more in 1987, then level off at the lower end of the scale until the end of the decade.

A 15 percent decline in energy prices, fueled by a reduction in the price of crude oil from 1985 to 1986, also helped food processors. This had a complementary effect of reducing the cost of transporting materials and finished products and of reducing packaging costs.

(Continued on next page)

Charles E. Morris, Midwest Editor; William C. Drennan, Senior Editor; Dianne Taylor Her[illegible], Contributing Editor, Ann E. Przybyla, Technical Editor; Linda K. Freeman, Contributing Editor; Kevin Hannigan, Features Editor.

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(Continued from previous page)

Strong stock performance

One barometer of a successful year is the status of industry stocks. "Food stocks in 1986 did extremely well," says John Maxwell of the New York firm of Furman, Selz, Mager, Dietz & Birney, as the industry saw "high visibility of earnings and earnings growth."

This has been the case since 1980. U.S. packaged food stocks have outperformed the market since that time and passed the S&P 500 in 1984 in actual as well as relative performance.

The strong performance of food stocks in 1986 is credited to food companies' expanded earnings power. When Value Line Investment Survey valued food stocks against its Industrial Composite, results showed that the average share earnings of those food stocks rose 57 percent in the '80s, compared with no growth in the composite.

This strength is a trend that is expected to continue through 1987 for a number of reasons, not the least of which are the new tax regulations that come into effect and, just as significant, the continuation of aggressive merger and acquisition activity. The ability of food companies to show a good return to their shareholders, yet still be able to successfully restructure, divest, acquire and consolidate, shows a well-managed industry where stocks should continue to hold a position of strength.

The forecast of slow growth for the country's economy in 1987 should also have a positive effect on food industry stocks, as their traditional show of strength and constancy during slow-growth periods will be a plus for investors.

Mergers & acquisitions

If there is one thing that everyone can agree on within the food industry it is that not only did the hectic pace of merger and acquisition activity continue in 1986, but it will continue through 1987 unabated. Just look at past history: There were 583 mergers/acquisitions in 1984, 658 in 1985 and 724 in 1986, according to statistics compiled by The Food Institute. This represents a 10 percent increase in activity in 1986 over 1985.

In just the first nine months of 1987, 516 mergers and acquisitions took place involving more than 414 companies in the food area. This represented a 3.6 percent increase compared to the first nine months of 1985.

In viewing 1986 from a mergers and acquisitions standpoint, what comes to mind first are the large megamergers and acquisitions, such as Beatrice's $6.2 billion leveraged buyout by Kohlberg, Kravis, Roberts and Company; Pepsico's $850 million purchase of Kentucky Fried Chicken from RJR Nabisco and subsequent purchase of Seven-Up international bottling operations from Philip Morris; and Quaker Oats Company's agreement, in late 1986, to acquire Anderson Clayton Company in a $800 million transaction. It seems the food industry has become like a large checker board, and certain companies are vying for the opportunity to "king" other firms.

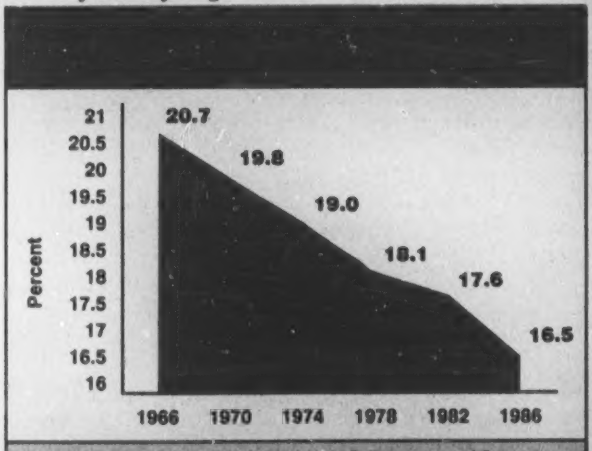
Of the total number of transactions that were consummated, 114 of them involved 59 companies. It seems one merger or acquisition begets another. After Beatrice's leveraged buyout, the company sold its soft drink bottling operation to the Coca-Cola Company ($1.2 billion). Coca-Cola then bought another bottling group ($1 billion).

Borden was busy in the past year, acquiring 15 companies and selling five businesses. Divested were low-profit or cyclical operations; kept were those areas of operation showing high-growth and high margin. Cash from sales of its operations were used to finance acquisitions holding down the company's debt.

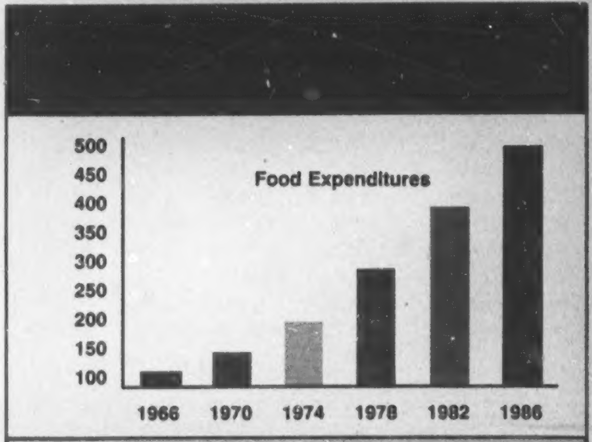
Why all the activity

One reason for all of the merger and acquisition activity is the desire to expand a company's share of the market. With the population growing at less than one percent per year, only about two million mouths are being added to the consuming public each year. Therefore, a logical way to make a company grow is to acquire wider distribution for your company's product line, or acquire a line not already a part of your operation.

Acquisition can be the best way to introduce your product through existing distribution lines. In essence, the food industry can buy larger market share rather than build it.



Source: Bureau of Economic Analysis U.S. Department of Commerce



Source: Bureau of Economic Analysis Department of Commerce

STATE OF THE FOOD INDUSTRY

As we look at the major trends, the number one trend is to leverage an existing trademark. It is quite obvious companies that wouldn't have dared to do that five or six years ago (such as Procter & Gamble, Coca-Cola) are doing it and are triggering more moves in that direction."

This in no surprise since brand names have become increasingly more important as American consumers choose trusted, known names for their food products over generics. This is a plus for the food companies because operating margins are significantly higher (estimated at up to 100 percent higher) on brand name products over generics.

Can the small processor survive?

There always has to be someone who pays the price for the success of another, and in the case of the return to brand names, the victim appears to be the small processor. Small food processors, who don't have the advertising clout of the major companies, often rely on less expensive off-brands to survive. Off-brands are dwindling in number on the food store shelf and in the freezer case as the battle of the name brands continues for space.

Al Clausi, senior vice president and chief research officer at General Foods, sees the decline of market share for the small processor as a reality. "This may be the shape of the future," he says. "We may end up with six or eight, or even ten, major companies."

Can the industry do it?

The question is: Can the food companies develop the new products consumers want? Is the creativity there? Are they willing to make the financial commitment?

According to Marketing Intelligence Service statistics, there were 3,389 new product introductions in 1986. Through mid-March of 1987 there were 601 introductions and the full year figure is projected to be 2,800.

The numbers for new introductions have been impressive over the last five to six years, but the question is raised about how many of these products are "new" products, and how many are line extensions. And what is the commitment of the food industry to providing new products? Are companies more committed to their bottom line?

Product	1984	1985	1986
Total Activity	583	658	724
By Industry Segment:			
Food Processors	89	95	114
Diversified Firms with Food Interests	48	39	57
Meat Packers	8	5	10
Poultry Processors	11	12	8
Soft Drink Bottlers	14	14	19
Wholesalers	36	36	35
Dairy Processors	13	21	9
Packaging Suppliers	25	26	29
Foreign Firms Buying U.S. Firms	40	55	59

Source: The Food Institute

"You could make an argument for that," says Edward Ogiba. In 1986 there was an "increase of 21 percent in terms of the number of new food products introduced. Yet as we traced innovation through our innovation index, the index for foods dropped to 13 percent from 14 percent the previous year. Despite a big jump in the number, we saw a decline in innovation."

Emphasizing the financial

"The general trend in business has been to emphasize the financial," says William Janis of the Department of Commerce. Compounding that trend is the tendency following a merger or acquisition to concentrate upon the financial end of the business as opposed to manufacturing and even marketing, he feels.

Frank Panyko of the Food Institute says mergers and acquisitions can have a negative effect on a company and its interest in producing new products. "People lose their jobs...the company gets lost in the paperwork and loses track of what their real purpose is in business."

"One expression I don't care if I ever hear again is 'lean and mean'," says Panyko. "Would you rather do business with someone who is lean and mean or someone who is fat and pleasant? When you see companies changing their philosophies radically, something is wrong there. Are they only looking at short-term goals and cost controls? Are they getting too cautious? Are the big companies afraid to take a chance?"

'Chasing our tail?'

Instead of taking a chance, Panyko sees the entrepreneurial spirit dwindling in major companies. "If the '70s was the 'me decade,' then the '80s is the 'me-too' decade in new product development," he says. Eventually, he maintains, you run out of products to copy or extend. "What are the people of the '90s going to copy? It is in the '90s that he foresees a resurgence of the entrepreneur. We will see a change," he says. "We need to alter the mindset. Bottom line is very important, but it isn't the sole important thing. We are chasing our tail right now."

Some industry activity in mergers and acquisitions Panyko describes as "a non-productive attempt at productivity." When Company A acquires Company B and sells off pieces, "they haven't created anything," he says, "they make money, but not a company and not a product."

Al Clausi of General Foods disagrees, in part. "I would think, on balance, if anything, {merger and acquisition activity} has stepped up new product activity. I think the only place where that might not apply is where there has been a hostile takeover or a portfolio buy-out where a private investor is buying a company to sell parts of it. Those have shown some signs of being disruptive."

But, says Clausi, "RJR Nabisco, Philip Morris, Campbell, Heinz acquiring other companies – that kind of con-

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solidation and merger has been positive for productivity and output."

What lies ahead?

Where are the opportunities for the food industry? Foreign markets, for one, and in added-value niche markets. It will be necessary for processors to get into regional markets because, says Herbert Baum, "it is in the regional demographics that we can see opportunities in ethnic foods, portion-controlled products and yuppie-type foods." Both Baum and Clausi of General Foods foresee the acquisition—as we noted above—of local regional suppliers of fresh products by major companies.

"I feel we are rapidly losing our advantage internationally in food processing," says Clausi, "just as we may have already lost a good deal of our advantage in commodity foods. It is going to take a different attitude on the part of the government, a more enlightened public, which government has to play a role in, and it also is going to take some catching up in technology. I don't see mergers as necessarily being contradictory to that. It may be the way we have to go. The regional companies cannot manage that."

Clausi further feels that what the food industry needs is government to make sure that there is a reasonable balance of competition around the world. "I think we need a more benevolent or sensitive set of American trade policies taking into consideration American rights around the world. We need a better attitude on the part of government to innovate," he says.

And the beat goes on

The food industry has proven itself to be steady and stable. Even when the economy starts to slow, consumers keep food spending relatively even. This means relative stability of profits, employment and capital expenditures.

"Modest pace" has been used to describe the growth of the economy in 1987. Real GNP is projected to increase just 2.8 percent from the fourth quarter of 1986 to the same period in 1987, according to Goldman Sachs & Co. The jury is out on whether the country will experience a recession. Some economists think a mild recession is coming, others feel it will not happen, but that economic performance will not be up to par.

Merger and acquisition activity will continue, perhaps not experiencing the megamergers of the past year or so, but the food industry will continue to expand through this type of activity. Food companies will continue to enhance the visibility of brand names through acquisition of new distribution channels and to expand their product lines through acquisition of other firms.

Some of the challenges of 1986 are the same for 1987. To find and win niche markets; to develop new products to meet demanding consumer needs; to continue to restructure for enhanced strength and performance. The marketplace will be a tougher arena in 1987, but past performance has shown the industry can pick up any gauntlet thrown. 1987 will be a year to see how well they can do it.

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Rank	Company	Sales ($ mil.)*	Rank	Company	Sales ($ mil.)*
1	Philip Morris/ General Foods	14,806.1	55	Keebler Co.	939.5
2	RJR/Nabisco	8,533.0	56	American Finance Corp.	930.1
3	Beatrice Cos., Inc.	8,122.0	57	Prestige Foods	901.7
4	Dart & Kraft	7,100.0	58	Adolph Coors, Inc.	864.2
5	Coca-Cola Co.	6,831.8	59	Perdue, Inc.	848.1
6	Anheuser-Busch	6,829.0	60	McCormick & Co.	845.2
7	Occidental Petroleum-IBP, Inc.	6,510.0	61	Foster Poultry Farms	825.1
8	PepsiCo	5,975.6	62	Hanson Trust Ltd.	819.3
9	Sara Lee Co.	5,844.0	63	Southland Corp.	804.2
10	Nestle Holding Co.	5,496.3	64	Idle Wild, Inc.	804.0
11	Ralston Purina Co.	5,156.1	65	American Brands Inc.	756.8
12	Archer Daniels Midland	5,110.0	66	Interstate Bakeries Corp.	708.5
13	Campbell Soup Co.	4,378.9	67	Cedar Rapids Meat, Inc.	707.2
14	H.J. Heinz Co.	4,190.3	68	Flowers Industries Inc.	698.4
15	John LaBatt, Ltd.	3,581.4	69	National Distillers & Chemical Co.	680.0
16	Mars Inc.	3,514.0	70	Lykes Brothers Inc.	662.4
17	Borden, Inc.	3,362.7	71	Ocean Spray Cranberries, Inc.	636.0
18	Conagra, Inc.	3,258.6	72	Warner Lambert	626.0
[illegible]	General Mills	3,061.3	73	Smithfield Foods	622.7
[illegible]	United Brands	3,061.3	74	William Wrigley, Jr., Co.	620.3
21	Pillsbury	3,030.0	75	Pabst Brewing Co.	613.1
22	Swift Independent	2,968.0	76	Curtis Burns, Inc.	603.0
23	Quaker Oats	2,955.2	77	Kane Miller Corp.	602.7
24	Kellogg, Co.	2,930.1	78	General Cinema Corp.	599.3
25	Procter & Gamble	2,923.0	79	Farmland Foods Corp.	599.0
26	Canada Packers	2,694.0	80	Savannah Foods & Industries, Inc.	598.0
27	CPC International	2,522.9	81	Thorn Apple Valley, Inc.	581.0
28	Staley Continental	2,468.8	82	MEI Corp.	555.0
29	Hershey Foods	1,768.0	83	Schreiber Foods	547.6
30	Joseph E. Seagrams	1,715.0	84	California & Hawaiian Sugar Co.	537.0
31	Stroh Brewery Co.	1,545.0	85	Sun Diamond	537.0
32	Castle & Cooke, Inc.	1,526.3	86	Farmstead Foods	530.4
33	American Home Products	1,519.0	87	Cadbury-Schweppes	521.0
34	Agway, Inc.	1,504.0	88	Riceland Foods	504.0
35	George A. Hormel	1,502.2	89	Superiors Brand Meats	504.0
36	Tyson Food, Inc.	1,535.7	90	Universal Foods Corp.	493.0
37	Wilson Foods Corp.	1,454.2	91	Tri-Valley Growers, Inc.	486.0
38	Montfort of Colorado	1,410.0	92	Forstmann Little & Co.	485.1
39	IC Industries	1,379.6	93	E&J Gallo Winery Inc.	450.0
40	International Multifoods	1,355.4	94	Winn Enterprizes	473.2
41	Mid America Dairymen	1,344.0	95	American Bakeries, Inc.	454.4
42	Land O'Lakes	1,327.0	96	J.R. Simplot, Inc.	445.8
43	George Weston, Ltd.	1,316.0	97	C. Schmidt & Sons, Inc.	422.9
44	G. Heileman Brewing	1,304.0	98	Peet Packing Co.	385.2
45	The Federal Co.	1,281.8	99	Moorman Mfg. Co.	367.7
46	Thomas J. Lipton	1,260.8	100	Rich Products Corp.	366.7
47	Central Soya Co.	1,233.0			
48	Molson Co., Ltd.	1,128.0			
49	GrandMet USA	1,059.8			
50	Goldkist, Inc.	1,059.8			
51	Dean Foods Co.	1,013.3			
52	McKesson Corp.	1,000.1			
53	Brown-Forman Corp.	971.9			
54	Amstar Holdings, Inc.	958.5			

* Food & Beverage Sales Only   Source: Food Engineering

STATE OF THE FOOD INDUSTRY

JUICE AND SOFT DRINKS

(Continued from page 70)

The face of the U.S. soft drink industry changed dramatically in the past year or so as the major players continued to acquire new brands, consolidate and move into international markets. And a third force has appeared in the field. Hicks & Haas, a Dallas investment firm, has bought a major portion of the soft drink industry. H&H first bought a major interest in A&W Brands, Inc. (*A&W* root beer), then picked up *Dr Pepper* from Frostman-Little, and finally acquired both the domestic *Seven-Up* operation and *Squirt*. Then, just a few months ago, H&H went after Coke and Pepsico with *Cherry 7Up* and *Diet Cherry 7Up*.

Also, U.K.-based Cadbury-Schweppes bought both *Canada Dry* and *Sunkist* brands in 1986. The additions make Cadbury-Schweppes, which already franchises club soda, tonic water, ginger ale, etc. under the *Schweppes* label, the dominant player in the mixer category.

Currently, Coke owns about 40 percent of the soft drink market, Pepsico has 30 percent, the Seven-Up/Dr Pepper/A&W combine 13 percent, *Royal Crown* 5.5 percent, and Schweppes-Canada Dry about 5 percent. Some industry observers speculate that the Seven-Up/Dr Pepper/A&W line will merge with the Canada Dry/Sunkist/Schweppes line in the near future, since Cadbury-Schweppes already owns 30 percent of Dr Pepper. Also, Royal Crown – the other cola drink – may eventually join that family to give it a combined market share of about 23.5 percent.

During 1986, both Coca-Cola Co. and Pepsico purchased some of their largest franchised bottling operations and became major factors in soft drink production and distribution. Coke also established Coca-Cola Enterprises, Inc. to own and operate its bottling operations. The new subsidiary, with an annual turnover of $3 billion, will produce and distribute almost one-third of all *Coca-Cola* bottled and canned drinks in the U.S. Pepsico also will package and distribute over 30 percent of its U.S.-brand soft drinks. This vertical integration gives both Coke and Pepsi greater control over product marketing – especially pricing. Another marketing change intended to boost margins without harming volume was the introduction of new juice-added soft drinks. Pepsico broadened its *Slice* line, while Coca-Cola fortified its *Minute Maid* citrus-flavored sodas.

Through all of this, the value of bottled and canned soft drink shipments reached $20 billion in 1986, for an inflation-adjusted gain of 3.1 percent. Total soft drink consumption increased 3-5 percent, with per capita consumption rising 2-3 percent, to 46 gallons.

In 1987, soft drink consumption will increase slightly, retail prices will remain steady, and industry shipments should rise about 2.5 percent. Over the next 3-5 years, estimate observers, the soft drink industry should grow about 5 percent per year. And part of that growth will be due to a higher consumption rate by adults. Diet drinks and fruit-based drinks are likely to be a large part of this growth.

Fruit-flavored soft drinks, in fact, may become the major growth area for the next several years. In effect, the soft drink industry is already in the juice business and will continue to grow that segment with more product innovations and higher levels of juice.

Per capita consumption trends
(gallons)

Product	1981	1985
Soft drinks	38.3	44.5
Juices	6.7	6.4
Powdered drinks	6.0	6.0
Bottled water	1.9	5.2
Total consumed	52.9	62.1

Source: Commerce Department

According to a recent study by FIND/SVP, the market for fruit and vegetable juices, about $9.38 billion in 1985 retail sales, should top $11 billion by 1990. In the last five years alone, says the research firm, U.S. consumption of juice products has risen 36 percent. Factors included a growing consumer taste for exotic flavors (mango, papaya, kiwi, etc.), the popularity of aseptic packaging, and the growth of low-cost imported juice concentrates.

"The greatest gains will be made by the blended 100-percent juice segment – which should command 40 percent of the market by 1990 – and by drinks containing 70 percent or more of juice," says Peter Allen, FIND/SVP Manager of Market Research Reports. He adds that artificially sweetened powdered drink mixes, which appeal to diet-conscious adults, will see significant growth.

Consumer interest in health and fitness has been a major factor in the fruit juice industry's growth – boosting total juice sales about 16 percent since 1981. Now, FDA's approval of aspartame for juices and related items (such as frozen novelties) has created a low-calorie segment in the fruit juice market. TreeSweet Co., Houston, TX, was first in the market with an aspartame-sweetened juice – its *Tree-Sweet Lite*, a 50-percent juice product. Coke's *Minute Maid Light 'n Juicy* low-calorie fruit beverage, 10-15 percent juice in four flavors, hit the market a few months later. Procter & Gamble's *Citrus Hill* and Beatrice Co.'s *Tropicana* were expected to follow suit.

The fruit juice market is changing in other ways, too. Today, juice is an ingredient in wine coolers, soft drinks, tea, even bottled water. This change from a commodity to a food ingredient has come with the development of hybrid, or composite, drinks – not blends of similar items but of juice, water, wine, etc. Also, wineries, dairies and private labels have profited by turning excess capacity in their packing lines into juice production. Examples include juice-based products such as Canadaigua Wine's *Esprit de Vie* non-alcoholic sparkling grape and apple juices for adults, and juice-flavored drinks for kids such as Green Spot's *Pink Panther*. Furthermore, growing acceptance of aseptics, cans, and other single-serve containers has led to a greater involvement by soft-drink bottlers – acting as both packers and distributors of juice and juice-based products – especially for vending machine sales.

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STATE OF THE FOOD INDUSTRY

SEAFOOD

(Continued from page 72)

Americans are enjoying seafood to a greater extent than ever before – per capita consumption reached 15 pounds in 1986. This is the good news. The bad news is: There is a limited supply of popular seafood varieties such as cod, salmon, and haddock.

One problem is that the increased demand for seafood – especially popular varieties – is driving up prices. So far this hasn't been a detriment to sales. But John Block, director of the National Wholesale Grocers Association, warned those attending the Boston Seafood Show last March that if seafood prices get too high consumers will back away.

Despite the concerns with meeting consumer demand, the seafood industry has set a goal of 20 pounds per capita consumption by 1990. To meet this goal, the potential of underutilized fish species will need to be realized along with an increase in aquaculture, or fish farming.

"It is estimated that aquaculture will produce about 25 percent of the annual total world catch of fisheries by the year 2000 – up from its present level of about 10 percent," said Colin E. Nash, Program Leader, Aquaculture Dev. & Coordination Program, FAO, Rome, Italy, at the Boston Seafood Show.

The salmon farming industry in Norway in 1986 produced a record breaking 45,000 tons, continued Nash. In shrimp farming, Continental Asia produced about 108,000 tons in 1984, while Ecuador's farmed production is now about 35,000 tons and at times greater than the natural harvest.

Right now, catfish, trout, crawfish, and oysters are the most commonly farmed seafood in this country, with most of the trout and about 95 percent of the catfish sold commercially in this country being farmed.

The demand for canned and cured seafood will continue on a slow growth pattern, Nilo Cachero, Council and Trade Commissioner, Canadian Consulate General, Boston, predicted. The growth areas will be in fresh and frozen seafoods.

To meet the goal of 20 pounds per capita, fresh/frozen seafood consumption will need to increase from 2,290 million pounds (edible weight) in 1986 to 3,400 million pounds in 1990, Cachero noted. Included would be an increased consumption of surimi from 120 million pounds in 1986 to 300 million pounds in 1990, and of underutilized species from 305 million pounds in 1986 to 640 million pounds in 1990. This would amount to an additional catch of 460,000 metric tons of underutilized fish.

Cachero said that 470,000 to 760,000 metric tons of catch are available between now and 1990. Examples of potential underutilized fish are: Redfish, turbot, witch flounder/plaice, silver hake, other hakes, and mackerel from the North Atlantic; hake-type icedevils/toothfish, rockcods, and southern blue whiting from southern oceans; orange rought, hoki, oreo dory, and snappers from the South Pacific; groupers from the Indian Ocean; and others.

The National Marine Fisheries Service is selecting people for a National Fish and Seafood Promotion Council which was legislated in the last Congress. This council is authorized to spend approximately $9 million over the next four years on generic seafood promotion programs. The council is also authorized to conduct market research.

Seafood still has a long way to go before reaching the promotion budgets of the beef and pork industries, pointed out Block. Yet the seafood industry does have a number of things in its favor:

1) People today more than ever before are looking for variety in their food – this includes seafood.

2) Two-thirds of the seafood consumed in this country is through food service – if people are taught how to prepare seafood, home consumption could increase.

3) Seafood fits in to the health conscious diets of many of today's consumers.

4) Ethnic foods are popular and many ethnic dishes contain seafood.

Block concluded by saying that although he is skeptical about reaching the 20 pounds per capita consumption by 1990, seafood consumption will continue to increase.

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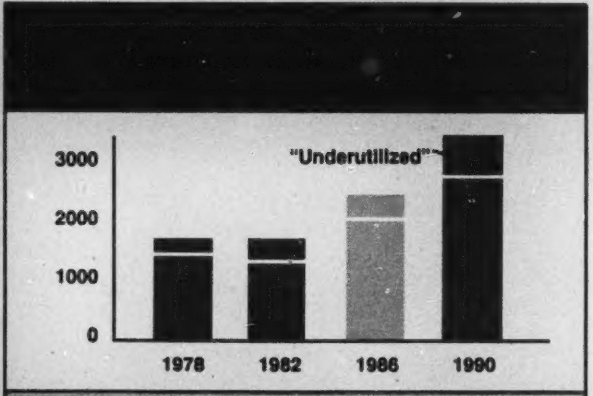
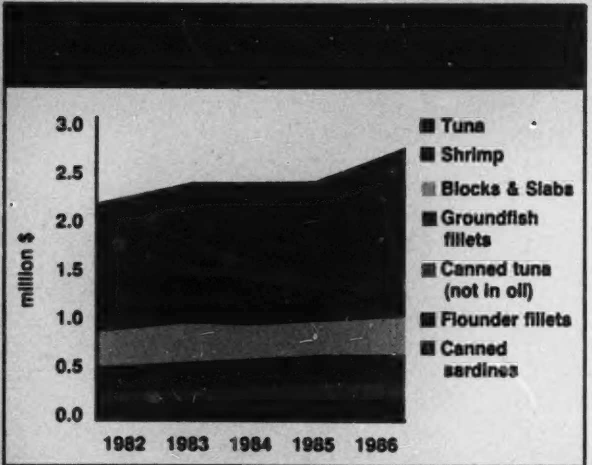


Source: Nilo Cachero, Council & Trade Commissioner, Canadian Consulate General, Boston



Source: Fisheries of the United States.

STATE OF THE FOOD INDUSTRY

MILK AND DAIRY PRODUCTS

	1984	1985	1986	1987*
Natural cheeses	21.57	22.39	22.90	23.47
Processed cheese items	7.70	7.57	7.82	8.01
Fluid whole milk	122.72	120.08	121.36	–
Lowfat milk	80.80	82.07	84.77	–
Skim milk	11.93	12.11	12.51	–
Yogurt	3.58	3.92	4.05	4.45
Cottage cheese	4.06	4.02	4.02	–

*Estimates

SOURCE: USDA [illegible]nomic Research Service, International Trade Administration, Find/SVP

(Continued from previous page)

This year's figures show a marketing metamorphosis taking place in the dairy industry—a change that is beginning to pay off and, say the experts, will continue to do so.

Thanks to nutritional advantages and convenience, lower-fat dairy products and calcium-rich cheese topped the list in terms of consumption and sales. But because of these same nutritional concerns, whole milk and butter didn't fare so well.

In 1986, the U.S. Department of Commerce recorded a 1.5 percent rise in total dairy shipments, with results ranging from a 3.5 percent increase for ice cream and frozen desserts to a 4.9 percent drop for condensed and evaporated milk.

Because input and packaging prices remained moderate in 1986, dairy product prices remained stable, resulting in a weaker demand for cheese substitutes. Only ice cream and canned milk cost more for the consumer.

- *Cheese.* Each American consumed 20 pounds of cheese in 1986, says Business Communications, Inc., and demand for cheese is predicted to grow by over 13 percent annually through 1995, thanks to an "increasing consumer awareness of the need for calcium in the diet," generic advertising, and continued assistance from Uncle Sam.

In 1986, says the Commerce Department, the United States government bought 19.2 percent of total American cheese output. Also, the U.S. Department of Agriculture has begun a dairy export-assistance program that will continue through 1989.

In 1986, per capita consumption of Italian cheeses gained 4.6 percent over 1985, while American types increased 2.2 percent. And, reversing a recent decline, demand for processed cheese products increased 3 percent. Says the Commerce Department: total per capita consumption of cottage cheese declined in 1986, yet lowfat cottage cheese consumption has increased by 3.3 percent annually from 1982 through 1986.

- *Ice cream.* Over the past six years, ice cream consumption rose 6.7 percent annually, due to demand for premium items. Apparently, however, this market growth will begin to slow, due to strong competition for the premium ice cream consumer's dollar among ice cream manufacturers.

- *Yogurt.* The $2-billion yogurt market grew 10 percent last year, and, predicts Find/SVP, will continue on this fast-track for the next few years, thanks to marketing efforts that are carving out new yogurt niches. Breakfast-oriented, children's, premium and dessert yogurts have all found success in today's marketplace.

"Yogurt marketers have launched aggressive marketing efforts to combat growing competition in this nearly $2-billion product category," reports Peter Allen, Find/SVP Manager of Published Studies. The research firm predicts four basic yogurt trends for the future: snacktime positioning; a slew of new products, including high-calcium and non-fat lines; new packaging innovations; and intense competition from some of the largest food manufacturers, including H.J. Heinz.

- *Butter/Margarine.* Constant dollar shipments for butter, says the Commerce Department, edged up .4 percent, as per capita consumption rose 2.5 percent, to 5.2 pounds. Why? Stable retail prices, generic advertising and "modest" success of butter-margarine blends.

Overall performance for butter, however, will slide again as margarine chomps out an even larger share of market. Per capita consumption of margarine rose 6.8 percent to 11.6 pounds in 1986, and, according to Business Communications, market share will more than double by 1995.

- *Milk.* Whole milk finished last in the dairy category this year; per capita consumption again fell 1.8 percent.

Lower-fat milks, however, took up this slack—plus some. Low-fat milk consumption increased 2.9 percent for 1986 over 1985, while skim milk consumption increased 3.3 percent.

This trend will continue, according to Business Communications, which predicts that low-fat milks will increase its fluid dairy market share from 39 to 54 percent by 1995—from $4.9-billion in 1986 to $8.85 billion. Says Business Communications: the entire low-fat dairy market is now worth $7.3 billion.

In sum, predicts Find/SVP, the total dairy market will increase to $17 billion in 1988, a 24 percent increase over 1984. Cheese sales will fare best, increasing 30 percent by 1988 over 1984. Americans, says Find/SVP, will consume $11-billion worth of cheese in 1988. Gains in Italian varieties will be especially prevalent.

And though a modest increase in the milk-consuming, 15-year-old and under population will spur a small rise in whole milk consumption, the fluid milk category will grow in shipments due primarily to a higher demand for skim and low fat milk, yogurt and cottage cheese.

Finally, butter consumption will continue to decline, says the Commerce Department, as the proportion of adults who have grown up using very little butter continues to increase.

In the dairy segment, yogurt, cheese and lowfat milk hold the most sales potential for tomorrow.

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STATE OF THE FOOD INDUSTRY

MEAT AND POULTRY

(Continued from page 76)

For the first time in history, U.S. per-capita consumption of poultry will surpass per-capita consumption of beef in 1987 – and by a whopping 4 lbs. That's what USDA forecast last February. But will it really happen?

According to USDA, overall U.S. meat consumption hit a record 215 lbs. per capita in 1986 but will slide by nearly 2 lbs. this year. Americans ate more beef than expected last year but poultry continued to boom, reflecting consumer concerns about fat and cholesterol and also acceptance of the many fresh and frozen convenience products introduced by poultry packers. Per-capita consumption of poultry first surpassed per-capita pork consumption in 1982, and per-capita consumption of chicken alone surpassed that of pork for the first time in 1986. This year, USDA projects poultry outpacing beef by 4 lbs. per capita and chicken surpassing pork by 3.9 lbs.

But that was before "60 Minutes" shook consumer confidence in poultry safety on March 29th. Impact if any on consumer poultry purchases was uncertain at press time, but USDA's February forecast of 62.3 lbs. per capita for 1987 may prove high.

According to USDA, beef production rose 3 percent last year to 24.4 billion lbs. from 23.7 billion lbs. a year earlier, but will slide 6 to 8 percent to 22.7 billion lbs. in '87 as herds stabilize with the end of the Dairy Termination Program. Current cattle inventory, in fact, is the lowest since 1962. Reduced supply will be largely offset by reduced demand, but choice-fed steers will fetch a few dollars more than the 1986 average of $57.75 per cwt and retail prices may rise 3 to 5 percent.

Pork production slipped 4 percent in '86 to 14.2 billion lbs. from 14.8 billion a year earlier as producers trimmed hog herds to maintain profits after low returns in 1983-85, but should edge-up to 14.3 billion lbs. this year. Hog prices might decline an average of $1 per cwt as feed prices stay low, but retail prices will average about the same as '86.

Poultry production surged 6.2 percent in 1986 to 18.4 billion lbs. from 17.3 billion a year earlier and USDA forecasts another 7 percent leap in '87 to 19.7 billion lbs. Of this, 15.9 billion will be chicken (up from 15.1 billion in '86), 3.8 billion will be turkey (up from 3.3 billion).

According to the Department of Commerce, overall meat shipments rose 2.7 percent in '86 to $68 billion, but in constant dollars the gain was only 0.9 percent. Red meats accounted for 83 percent of shipments ($57.6 billion), down from 85 percent in 1982 but up a modest 0.2 percent from '85. Commerce projects red-meat shipments declining this year to $55.6 billion. Shipments by meat packers last year totaled $42.1 billion; shipments by meat processors (sausage, prepared meats) were $12.5 billion. Twenty-seven percent of fresh meat sales were posted by the top four packers: IBP (Occidental Petroleum), EXCEL (Cargill), Oscar Mayer (General Foods) and Swift Independent. In processed meats, 19 percent of sales were recorded by the top four firms: United Brands (John Morrell, Rath), Sara Lee (Jimmy Dean's, Kahn's, Hillshire), Hanson Trust (Hygrade) and Beatrice (Eckrich, Swift).

Red-meat imports were flat at $2.4 billion as Danish pork imports fell due to reduced export subsidies and appreciation of the kroner. Exports rose 17.4 percent to $2.4 billion as USDA purchased 90,000 metric tons of dairy-terminated beef for sale to Brazil. Beef exports to the EC reached EC import quotas for the first time since 1979.

Poultry shipments soared 15 percent last year (9 percent in constant dollars) to $13.3 billion and profits rose to pre-1980 levels (1.3-2 percent) due mainly to low feed costs. The top four poultry packers – Foster Poultry Farms, Holly Farms, Perdue and Tyson – posted 19 percent of sales. The next four – Gold Kist, Con Agra, Continental Grain and Beatrice – recorded 10 percent. Poultry exports rose for the first time in five years to $328.7 million, with Japan and Hong Kong taking 48 percent.

Some trends: MRCA Information Services reports that processed meats labeled "lean," "low-fat" and "low-calorie" zoomed 66 percent in 1985 to 7.7 percent of sales in the processed-meats category. "Low-salt" lunchmeats gained 33 percent. Red-meat association efforts to address consumer concerns about fat, cholesterol and convenience include the National Livestock & Meat Board's "Nutri-Facts" point-of-purchase program and the National Pork Producers Council campaign which positions pork as "the other white meat," but efforts by individual packers were isolated. Most innovative: Kroger Co., which first initiated a 1/4-inch trim program at store level, then introduced trimmed, pre-seared microwaveable vacuum-packaged meats in several markets, and on May 1 of this year introduced Ultrabeef in Houston. Ultrabeef, developed jointly by Chesapeake Genetics and Ultrabeef Ranches and introduced earlier this year in Eastern markets by Giant Foods and Mayfair Supermarkets, combines genetic selection, embryo-transplant and computerized feed-formula technologies to produce beef with up to 46 percent less fat (120 calories per 3-oz. serving) than typical beef on far less feed: Animals reach market weight in only 13-14 months compared to the typical 20-24 months. New packaging technologies such as controlled-atmosphere packaging might shift retail meat cutting more toward packer level for economies of scale and branded beef/pork cuts to compete with branded poultry products. (EXCEL is already marketing branded, vacuum-packaged beef cuts.) Intense brand competition will shake-out the poultry industry to fewer but bigger packers.

Year	Beef	Pork	Chicken	Turkey	Veal	Lamb
1984	78.5	61.7	55.6	11.4	1.8	1.5
1985	79.1	62.1	58.0	12.1	1.8	1.5
1986	80.6	58.6	59.9	13.5	1.9	1.4
1987 (Est)	73.9	58.4	62.3	15.6	1.6	1.4

Source: USDA

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STATE OF THE FOOD INDUSTRY

ALCOHOLIC BEVERAGES

(Continued from page 78)

The alcoholic beverage industry is still in a slump, but new products and a trend to lighter drinks may pull it out. The biggest problems, however, may be negative publicity and price. Concerns about drunken driving and health (does alcohol cause cancer?) have put a crimp in per capita consumption, for example. And worse times may be coming in the form of a new Federal excise tax increase.

In 1986, distilled spirits consumption fell 1-3 percent overall, and about 3 percent per capita. Beer, spurred by a strong demand for imports, gained slightly in dollar volume but remained at about 24 gallons per capita. Wine consumption, thanks to wine coolers, rose 3-4 percent, with a per capita consumption of almost 2.5 gallons. Overall, the value of alcoholic beverage industry shipments reached $18.6 billion last year, up 1.6 percent from 1985.

In general, the brewing industry had a good year in 1986. Domestically, Anheuser-Busch, Miller and Coors showed volume gains, while Heileman (down 1.0 percent), Stroh (down 2.5 percent) and Pabst (down a whopping 15-20 percent) were losers. A-B, which owns 38 percent of the market, gained about 1 percent and Miller was up about 4 percent. And, thanks to geographic expansion and new-product rollouts, Coors' shipments rose about 3.4 percent.

U.S. beers began to acquire an international flavor, too. Swan Brewery Co., Ltd., Australia, bought the Pittsburgh Brewing Co. (*Iron City*, etc.). And Pabst Brewery Co. entered a joint-venture with the Chinese to serve Mainland China and Hong Kong. Miller Brewing also expanded overseas, licensing Britain's Courage Ltd. to market *Miller Lite*. A-B, which already has a foothold in the U.K., licensed production of *Budweiser* in Ireland (via Guiness Ireland Ltd.) and Denmark (United Breweries).

The U.S. wine industry picked up in 1986 when the market for wine coolers jumped 60 percent, reaching 61 million cases. Sales probably exceeded $1.2 billion at retail compared to $750 million in 1985. Domestic premium wines also did well, due to perceptions of improved quality and increased prices for most imports. In the first half of 1986, total wine gallonage imported from all sources decreased 21 percent, while the average price per gallon rose 30 percent. Less expensive wines suffered, though, while the more expensive varieties gained in volume and price.

In the $1.7-billion wine cooler market, Gallo, Brown-Forman, Canadaigua and Seagram together control about 75 percent of total sales. Brown-Forman's *California Cooler*, the leading brand since 1980, has been overtaken by Gallo's *Bartles & Jaymes*. These two brands should dominate the market for some time, with many smaller-volume brands fading. Overall, the wine cooler category should grow 12-15 percent a year over the next five years. But fewer brands will share this expanding market.

There were few bright spots for distillers in 1986. Liquor consumption remained low, the trend away from whiskeys continued, and even the demand for gin and vodka softened. Some firms, following a consumer trend to lighter, milder and less alcoholic drinks, have introduced light and sweet drinks with considerable success. One example is low-alcohol cordials and liqueurs flavored with peach, apricot, peppermint, coffee, cinnamon, etc. This new generation of cordials already accounts for 3 percent of the U.S. spirits market and should grow in the years ahead.

Premixed packaged drinks such as martinis and manhattans are popular, too. Now, according to an "insider" report in *Ingredient Strategies*, Brown-Forman is testing a pre-mixed mint julep. And Glenmore Distilleries will soon unveil two tequila-oriented drinks—*Chi Chi* premixed margarita and a margarita cooler called *Tequila Cooler*.

If the proposed excise tax doesn't come, the spirits industry may stabilize in 1987, though the real value of shipments will continue to decline. Beer consumption should increase a bit, imports' growth will slow, and domestic brewers will continue their battle for market share. Wine makers will likely do best of all. Demand for wine coolers should increase in 1987, but at a slower rate. Also, the weaker dollar will continue to hold back some imports.

Long term, the picture is glum. Consumers are switching away from alcoholic drinks and total consumption should decline for several more years. Thus, all alcoholic beverage producers will be fighting for a larger share of a smaller market. In the face of this no-growth domestic market, alcoholic beverage producers will step up their export sales efforts. This campaign should pay off as trade barriers are reduced and the economies of lesser developed countries improve. Adjusted for inflation, the value of alcoholic beverage industry shipments should increase at an average annual rate of 0.8-1.1 percent through 1991.

(Continued on page 85)

Value of shipments (in millions of dollars)

	1984	1985	Change	1986(e)	Change
Malt beverages	11,868	12,129	+2.2%	12,420	+2.4%
Wines, brandies	2,695	2,874	+6.6%	3,090	+7.5
Distilled liquor	3,405	3,289	-3.4%	3,076	-6.5%
Total value	17,968	18,292	+1.8%	18,586	+1.6%

Source: Commerce Department

Per capita consumption trends (gallons)

Product	1981	1985
Beer	24.7	23.8
Wine	2.3	2.3
Spirits	2.0	1.8
Total consumed	29.0	28.1

Source: Commerce Department

←Insert 55 or see FEM, p. 31

STATE OF THE FOOD INDUSTRY

BREAKFAST CEREALS

(Continued from page 83)

Ready-to-eat cereals show the greatest growth, but the entire cereal industry is "hot." For an industry vilified just a few years ago by certain "consumer advocates" as a purveyor of "sugar-laden junk foods," the cereal industry has staged an amazing comeback in consumer perceptions as a supplier of healthy and nutritious foods. With this perception added to the traditional convenience of ready-to-eat and "instant" hot cereals, breakfast cereals today fit demographic trends better than ever.

Cost trends, too, favored cereal producers last year, according to the Department of Commerce. Ingredient costs fell 4.7 percent (only dried fruits were up) and energy costs plunged 19.1 percent. Labor costs, however, rose 5 percent. And cereal producers were able to boost prices by an average of 6.1 percent last year, while retail prices rose 5 percent.

Results of favorable cost and marketing trends:

- Per-capita consumption of breakfast cereals soared 5.3 percent—from 14.2 to 15 lbs.—in 1986 as compared to 1985, says Commerce. After a slump in recessionary 1982, per-capita cereal consumption rebounded over the past four years with a hefty 19 percent gain.
- Value of industry shipments (all products from plants producing mainly cereal) grew 7 percent (3.9 percent in constant dollars), from $5.97 billion in '85 to $6.39 billion last year. Commerce forecasts $6.79 billion for 1987.
- Value of product shipments (cereal from all plants regardless of primary classification) grew from $4.52 billion in '85 to $4.84 billion in '86.
- Value of product shipments in the ready-to-eat segment scored the highest gain, said Commerce, jumping from $4.04 billion in '85 to $4.32 billion last year. According to Quaker Oats Co., industry sales in the ready-to-eat segment grew 12 percent in fiscal '86 (ended June 30) to $4.7 billion, "making it the second-largest grocery category in the U.S."
- Value of hot-cereal shipments, sparked by new instant varieties, jumped from $480 million in '85 to $514 million last year.
- New-product introductions in the cereal category jumped from 60 in 1985 to 71 in 1986, according to Marketing Intelligence Service (*FE* April, 1987). Adds William V. Janis of the Commerce Department, "Manufacturers of breakfast cereals tried to appeal to many market niches" with 194 varieties at the wholesale level in 1985, up from 181 in '84. Ready-to-eat types accounted for 151, hot cereals for 42.

"Fiber wars" and "the battle of the brans" intensified as manufacturers competed for the adult ready-to-eat cereal dollar with mixed-grain, high-fiber and fruit/nut varieties projecting a "healthy" image. According to Kellogg, who startled the entire food industry in 1984 with its All Bran health-claim campaign linking fiber to reduced cancer risk, "Americans' awareness of the health benefits from a high-fiber, low-fat diet continued to stimulate sales" during 1986 of All Bran, Bran Flakes, Bran Buds, Raisin Bran and Cracklin' Oat Bran. New from Kellogg in 1986: Three U.S. line extensions—aspartame-sweetened Extra Fiber All Bran, Nutri-Grain Almond Raisin and Apple Cinnamon Squares—plus Just Right All Grain in Canada. General Mills added Raisin Nut Bran to its earlier introductions of Fiber One and Bran Muffin Crisp (the latter "did not meet objectives," said GM). General Foods "increased or maintained market share" with Post Natural Raisin Bran, Fruit & Fibre and Grape Nuts. Quaker, conceding that intense competition adversely affected volume of Life and 100% Natural Cereal, unveiled two flavors of Oh's, "the first all-family cereal." Ralston extended its Chex line with two new entries; Nabisco rolled out Shredded Wheat 'n Bran nationally and Fruit Wheats regionally.

Categories	1981	1982	1983	1984	1985[1]	1986[1]
Total	12.73	12.59	12.95	13.59	14.23	14.98
Ready to eat	9.50	9.41	9.71	10.20	10.68	11.26
Corn	3.02	3.04	3.10	3.25	3.40	3.56
Wheat	3.19	3.10	3.17	3.31	3.47	3.63
Rice	1.21	1.19	1.21	1.27	1.33	1.39
All other except Baby cereal	2.08	2.08	2.23	2.37	2.48	2.68
Hot cereal	3.23	3.18	3.24	3.39	3.55	3.72

[1] Estimated by the International Trade Administration (ITA)
SOURCE: U.S. Department of Commerce, Bureau of the Census and ITA

But cereal producers didn't neglect the children's segment in the battle for supermarket shelf space. New in 1986: Rocky Road, Circus Fun, S'Mores Crunch and aspartame-sweetened Trix from General Mills; Ghostbusters, Nerds, G.I. Joe and aspartame-sweetened Cabbage Patch Kids from Ralston Purina; aspartame-sweetened Alfa Bits from General Foods. Meanwhile, Quaker boosted volume of Cap'n Crunch by 17 percent.

In the hot segment, where Quaker holds a commanding 67 percent market share, Quaker extended its Instant Oatmeal, Apples, Raisins and Walnuts line and introduced Fruit & Cream instant oatmeal in four flavors. Quaker further tested its own health-claim ads relating oat bran to reduced cholesterol levels.

According to Business Trends Analysts, Kellogg's leads the cereal industry with a 1985 market share of 42 percent, followed by General Mills (20 percent), General Foods (17 percent), Quaker (8 percent), Ralston Purina (7 percent) and Nabisco (4 percent).

Outlook: Breakfast cereal shipments will rise 2.6 percent, per-capita consumption by 2.9 percent in 1987, says Commerce. Inflation-adjusted shipments should gain 3.3 percent, per-capita consumption 2.4 percent per year through 1991.

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←Insert 53 on Inquiry Card

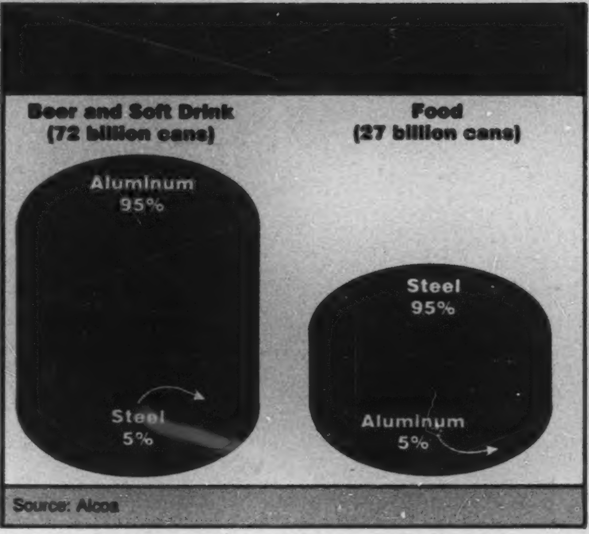
STATE OF THE FOOD INDUSTRY

CANNED FOODS

Industry Data	1984	1985	1986[2]	1987[3]	Percent change 84-85	85-86	86-87
Value of shipments	21,756	22,351	22,397	—	2.7	0.2	—
Value of shipments, 1982 $	20,179	20,490	20,692	2,002	1.5	1.0	1.5
Total employment (000)	128	124	127	127	-3.1	2.7	-0.3
Trade Data							
Value of imports	1,708	2,062	1,716	—	20.7	-16.8	—
Value of exports	558	533	551	—	-4.6	3.4	—

[1] SIC 2032, 2033, 2034, 2035 #
[2] Estimated
[3] Forecast

Source: U.S. Dept of Commerce



Source: Alcoa

(Continued from page 85)

Consumption of canned foods continues to slide in favor of fresh and frozen fruits and vegetables. According to the Dept. of Commerce, the value of shipments in the canned-foods sector of the processed fruits/vegetables/specialties category (SIC 2032-35, 2037-38) fell to 62 percent in 1986 from 65 percent four years earlier. Production value was flat at $22.4 billion, up 1 percent in constant dollars. The sectors sustaining growth in the canned-foods industry are soups, sauces, ethnic foods and aseptic juices.

According to USDA, per-capita utilization of vegetables for canning fell to 82.2 lbs. (farm-weight basis) in 1985 after peaking at 90.4 lbs. a year earlier, while per-capita use of fresh vegetables grew steadily from 81.3 lbs. in 1980 to 91.1 lbs. in 1985 and for freezing from from 16.6 lbs. in '80 to 17.6 lbs. in '85. Over the past 10 years, per-capita canning use of vegetables fell at a rate of 2 percent per year "primarily due to consumers' unpopular attitudes about canning vegetables' nutritional value," although continuing popularity of canned tomato products helped soften this slide, said USDA Economist Shannon Reid Hamm at the agency's 1987 Outlook Conference. Because of carryover from 1985, fresh-vegetable production fell 2-3 percent in 1986 and imports of 10 major fresh vegetables—which had grown steadily for six years to 1.5 billion lbs. in 1985—fell 20 percent last year.

The same trends are apparent in canned fruits: "Consumers are now more health and nutrition conscious and demand less sugar in any kind of food," said USDA Economist Ben W. Huang at the Outlook Conference. "Thus, sales of canned fruits traditionally packed in heavy syrup have declined." Although per-capita consumption of fruit (fresh-weight basis) grew from 199.2 lbs. in 1982 to 213.6 lbs. in 1986, per-capita consumption of canned fruits fell from 21.5 lbs. to 16 lbs. as per-capita consumption of fresh fruits rose from 86.7 to 92.5 lbs. over the same period. Per-capita consumption of processed fruits soared from 105.9 lbs. in 1984 to 121.1 lbs. in 1986—up 14 percent in just two years—but the gain was mainly in frozen products, especially juices.

Prepared soup shipments, after plateauing in the late '70s and early '80s, have grown 4-6 percent per year since 1984, Commerce reports. Canned soups have always been convenience foods and fit today's demographics better than ever, while microwaveable soups in aseptic and retortable plastic packaging will further boost this trend.

About 50 packers introduced aseptically-packaged fruit juice and juice drinks between 1981 and 1986, says Commerce, and per-capita consumption of "boxed" juices last year reached 1/2-gal., or about 4 percent of total juice/juice-drink sales. After annual sales gains of 20 percent 1981-85, aseptic juices grew 4-6 percent last year.

Meanwhile, canners and their suppliers are applying new technologies in an effort to recapture lost ground. American Can's *Salad Bar Fresh* process (*FE* April '85; Aug. '86) was cleared as GRAS by FDA effective Oct. 24, 1986 and is currently licensed to 38 canners. Continental Can's *Veri-Green* process, introduced commercially in 1983, is now used by six canners to pack between 20 and 30 brands of green beans and spinach. Continental's *Veri-Fresh* flame-sterilization process, which cut energy, material and distribution costs for canned fruits and vegetables in 1984 cannery pilot tests, has yet to be commercialized, however, because of high capital-investment costs required. Easy-open (tear-top) aluminum cans, formerly limited in food applications to small sizes because of pressure limitations on the closure, are now available in any size. Alcoa introduced easy-open aluminum can closures made of a new alloy combining lighter gauge with greater strength to withstand "the full range of processing equipment, from still retorts to hydrostatic and rotary cookers." Aluminum cans last year accounted for 95 percent of canned beer and soft-drink shipments but only 5 percent of canned-food shipments.

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STATE OF THE FOOD INDUSTRY

FROZEN FOODS

(Continued from page 87)

Frozen foods and the 1980s lifestyle have been called a natural team. In introducing New Traditions – a line of frozen, pre-broiled and browned meats to frozen breakfast sandwiches developed specifically for microwave preparation – Hormel keyed in on lifestyle trends of the '80s which are affecting the foods purchased by American consumers. For example:

- More working women and dual income families.
- Varied working schedules, which often lead husbands and wives to split daily child care times and chores.
- An increase in the number of households and people living alone.
- More choices for children with regard to how they spend their time.
- A higher priority on spare time and together time – what little of it can be found.

Hormel also listed how these trends have caused dramatic changes in the how American families eat. These changes are:

- Fragmented meals, with family members often eating at different times.
- More family members involved in preparing meals.
- Less time available for planning and preparing meals, and so, searching for ways to reduce and manage meal preparation time.
- A surge in the use of microwave ovens, which often cuts food preparation time by one fourth.
- More demand for high quality convenience foods, particularly everyday foods.

In frozen foods we've seen major growth in Mexican dishes, Oriental dinners, and vegetables without sauces, reports SAMI (see accompanying chart). Weight Watchers' new line of frozen Mexican entrees and Campbell Soup's new frozen Oriental dinner line are, in part, responsible for the recent growth in the first two areas, explains Alan B. Miller, Jr. of SAMI.

Consumption of selected frozen foods (millions)

	1986	change from '85	change one year earlier
Meat, frozen	$159	-9.6%	1.0%
Fish, frozen	$888	4.0%	-0.4%
Mexican dishes	$200	20.5%	29.9%
Oriental dishes	$275	-13.0%	-13.3%
Mexican dinners	$ 89	9.7%	4.1%
Oriental dinners	$ 56	16.7%	52.6%
Vegetables, w/ butter sauce	$ 73	-5.0%	-2.1%
Vegetables, w/ cheese sauce	$ 78	-13.1%	-3.9%
Vegetables w/o sauce	$ 92	14.4%	17.7%
International vegetables	$118	9.7%	-3.2%

Source: SAMI, New York, NY.

In the area of Ethnic foods, we are seeing a wider range of varieties being offered to satisfy American's desire for more variety in their foods. For example, Ruiz Food Products, Inc., Tulare, CA, includes Steak Fajita and Chicken Fajita in a line of frozen Mexican dinners introduced this past year.

The "health craze" is also having an effect on the types of frozen foods being sold. This can be seen by examining frozen vegetable sales. The growth in sales of frozen vegetables without sauce is most likely cannibalizing sales of frozen vegetables with cheese or butter sauce, Miller notes. But overall per capita frozen vegetable use in 1983-85 was up 12 percent from the 1974-75 period, according to USDA. That compares to an 18 percent increase in fresh vegetable usage in that time span and a 2 percent decline in canned vegetable use.

In the fruit category though, frozen consumption is gaining faster than either fresh or canned – both of which have remained relatively flat over the past few years according to USDA reports. But frozen strawberry imports from Mexico are increasing. Fifty million pounds of Mexican frozen strawberries were imported into this country between the beginning of the year and April 12 as compared to 19.4 million pounds for the same period a year earlier.

"The growing wave of calorie consciousness in America has made household words out of *lean, light, low*, and *reduced*," points out the Calorie Control Council. In other words, more than 78 million adult American are consuming low-calorie foods, up from 42 million in 1978. And frozen food processors have jumped on the low calorie bandwagon.

Last year, The All American Gourmet Company, Orange, CA, expanded its Budget Gourmet Slim Line entrees – all under 300 calories – into national distribution. In addition, three new Classic Lite frozen dinners from Armour Frozen Food Company and six Le Menu Light Style frozen dinners from Campbell Soup Company were also introduced into national distribution last year.

Overall, 77.4 percent of American consumers are buying either more or the same amount of frozen foods compared to three years ago, reports the Eastern Frosted Foods Association (EFFA). And this trend is expected to continue. For example, the market for frozen entrees and dinners, now $4.5 billion, is expected to reach $18.5 billion by 1994.

Another factor affecting the frozen entrees sales is who is purchasing them. Men now purchase 43 percent of all frozen complete dinners – a higher percentage than for any other packaged food product – and 40 percent of all frozen main dishes, according to a 1985 Purchasing Study.

Frozen foods are available to the consumer in three categories: To be eaten frozen (e.g., ice cream); thaw-and-serve (e.g., bagels, frozen fruit, desserts); and heat-and-serve (e.g., boil-in-bag, to be cooked in microwave or conventional oven, etc.). The typical supermarket stocks between 1,000 and 1,200 frozen food items, reports EFFA.

Offering convenience and a wide selection, frozen foods will continue to be an important of Americans' diets.

STATE OF THE FOOD INDUSTRY

SNACK FOODS

Snack food performance has been pleasantly consistent over the past few years – and there's no end in sight. Snack foods of all kinds – especially newly-developed, "wholesome" snacks – are growing.

According to Business Trends Analysts (BTA), overall 1986 snack food sales rose 8.1 percent over 1985, resulting in a total market worth of $26.8 billion. And, reports the research firm, snack food sales are expected to expand by 7.2 percent annually over the next decade, with sales topping $57.7 billion by 1996.

Processors have responded successfully to the mature demands of the expanding 35+ age group by offering higher quality, nutritious, gourmet, and/or premium snacks, such as microwave popcorn, fruit snacks, and nuts. "Snack food manufacturers have successfully redesigned their product and promotional strategies to satisfy the changing consumer pool, thus setting the stage for continued strong growth in the U.S. market for snack foods," comments BTA.

The overall wholesome snacks market grew 9 percent to over $600-million in 1986, says snack food processor Quaker Oats, "driven by a 35 percent increase in the fruit-based snacks segment." Quaker is heavily marketing its fruit snacks and rice cakes as wholesome snacks. In 1986, the entire rice-cake market totaled $20 million.

- *Dried fruit snacks.* Selling Areas Marketing Intelligence (SAMI) reports: dried fruit snack sales reached $264 million in 1986. Bite-size dried fruit snacks designed for children represent 44 percent of this market. General Mills is the leader in this category with a 61.4 percent share of market. And in 1986, General Mills' unit volume for fruit snacks increased 30 percent.
- *Popcorn.* Per capita consumption of popcorn is now pegged at 2.4 pounds. Adds SAMI: bags of popcorn are decreasing in sales, but microwave popcorn sales grew 5.7 percent in the last quarter of 1986 alone. Microwave popcorn, which now accounts for 25 percent of the total popcorn market and is worth $190 million in retail sales, is a hot item. "While this market is relatively small today, it is expected to show strong growth as more households obtain microwave ovens," comments General Mills.
- *Nuts.* The U.S. retail market for nuts has been increasing by about 6 percent/year and is expected to top $1.4-billion by 1990. The retail peanut market is worth about $500 million; the eight most important nuts in terms of annual tonnage include almonds, filberts (hazelnuts), cashews, walnuts, pecans, Brazil nuts, pistachios and macadamias, says R.J. Reynolds.

"There are several reasons for the growing popularity of nuts," says Eric Shullman, director of marketing for Reynolds' Planters Nuts Division. One of the most important is their nutritiousness. "Other reasons include strong population growth in the highest consumption group (35 to 55 year olds) and a continuing breakdown in main meal eating occasions."

"Grazing," or eating between meals, has, in fact, fed growth of the entire snack segment. According to SAMI, sales volume for saity snacks was $5-billion in 1986, with potato chips accounting for over half of this volume. Potato chip sales, says the research firm, will continue to rise as specialty items (new flavors, potato skins, etc.) become more popular. Kettle-cooked potato chips now control 5 percent of the potato chip market, says SAMI, and this market share is expected to double by the end of 1987.

Corn and tortilla chips are second to potato chips in the salty snack segment. These chips, however, seem to have reached market maturity, as reflected in 1985 figures (see 1986 State of the Industry report).

Typically a highly regional product, pretzels are holding relatively steady. According to the United States Department of Commerce, per capita consumption of pretzels decreased very slightly over the past three years: 1984 consumption was .79 pounds; 1985, .78 pounds; 1986, .77 pounds. Popular pretzel consumption areas of the country include the Northeast, particularly Pennsylvania, and the Midwest.

The most disappointing performer in the snack food segment in 1986: granola bars. "Cereal meal bars" declined after a smashing annual growth record of 20 percent over the past decade. Sales in this $439-million segment, which is now mature, fell 24 percent in the last quarter of 1986 alone, says SAMI.

Quaker Oats, the leader in this segment, admits: "These products require fairly significant underwriting . . . volume was down 15 percent in 1986 over 1985." But once competitive new product activity slows in the granola market, this sales decline will level off. Those companies that can survive the granola shakeout will again profit from this snack category.

The overall growth of the snack food market, however, can be attributed to the busier lifestyles of Americans – and processors' ability to take advantage of the expanding adult population.

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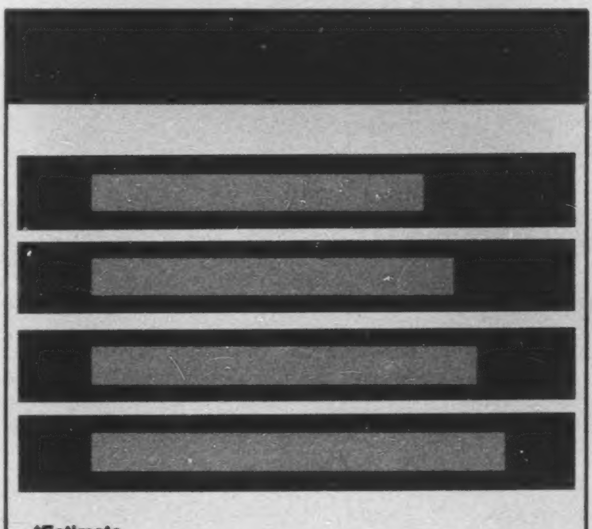


*Estimate

Source: Business Trend Analysts

STATE OF THE FOOD INDUSTRY

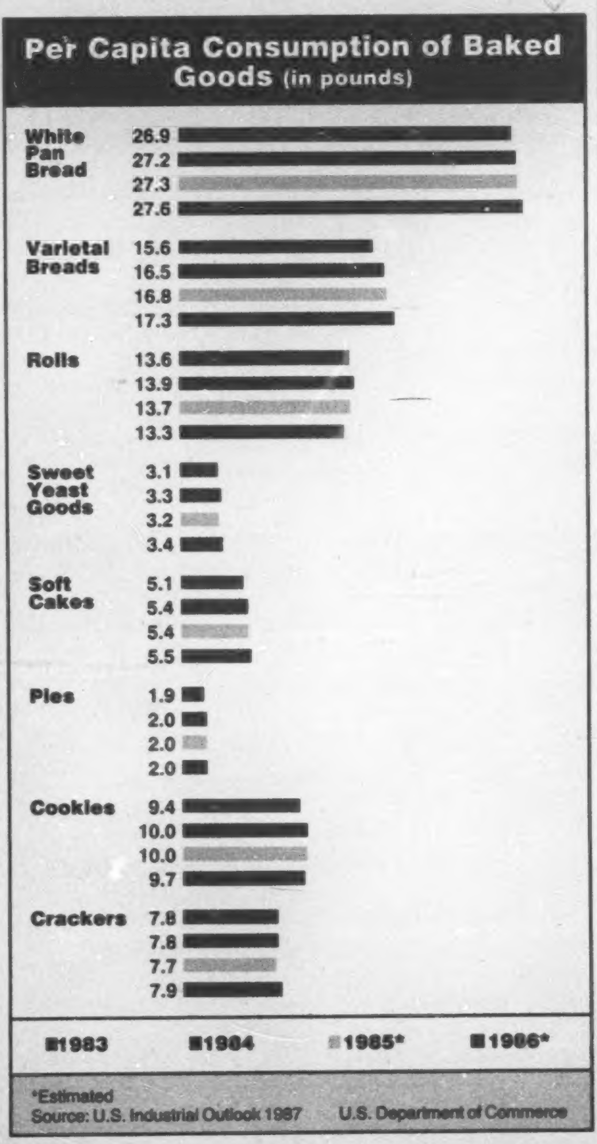
BAKERY PRODUCTS

(Continued from previous page)

It has been a year of good news for the bakery industry, with promising consumption increases in both white bread and crackers.

After a downward trend in consumption of white bread, which accounts for approximately 50 percent of bread consumed, 1986 saw an encouraging increase. (From 1967 to 1982 white bread consumption dipped 30 percent, according to industry sources.) But it's getting better.

In 1981 per capita consumption of white bread was at 29.3 pounds. In 1982 it dropped to 26.6 pounds and has slowly crept upwards since that time to reach an estimated 27.65 pounds per person in 1986. "When you look at the growth in some areas of the industry, that is not significant," says Judith Striegel of Rich Products, "but, back as far as 1963 and through the '60s and '70s, it was a downward trend, and to see it coming back up, that *is* significant."



Per Capita Consumption of Baked Goods (in pounds)

*Estimated
Source: U.S. Industrial Outlook 1987 U.S. Department of Commerce

Product shipments of white bread were valued at $2.6 billion in 1982 and have risen to $3.1 billion for 1986. Look for a 1.9 percent annual increase in shipments through 1991, says the Department of Commerce.

White breads have added to their appeal by increasing fiber content, an important consideration to today's consumers, and some have also increased calcium levels. The fact that the size of the 65-and-older segment of the population continues to grow has helped fuel the upswing in consumption.

In fact, the older and health-conscious younger population's demand for breads rich in fiber have spurred added fiber in all types of variety breads, and some new high-fiber breads have been introduced. Pepperidge Farm's line of *Five Star Fibre Bread* is one.

The Department of Commerce estimates that per capita consumption of variety bread increased 12.4 percent from 1982 through 1986. Whole wheat and cracked wheat took top honors, with consumption up 17 percent from 1982 to 1986.

Cookies and crackers also racked up double digit figures from 1982 to 1986. The nominal value of 1982-1986 shipments grew to 10.1 percent annually. Shipments of cookies increased 8.6 percent per year and crackers rose 11.9 percent per year during that time period. Actual figures for 1986 were somewhat disappointing in the cookie segment, with per capita consumption declining 2.5 percent. Shipments increased only 3.8 percent during that time. The slower growth of the cookie figure may reflect disappointing sales in the soft cookie segment of the market.

Crackers, following a 3.3 percent drop in 1985, rose a remarkable 24 percent in 1986, according to the 1987 U.S. Industrial Outlook. Per capita consumption rose 2.7 percent. Industry sources concurred with those figures. Contributing to the growth were low-salt varieties.

Once again, croissants, bagels and muffins performed well in the marketplace. The bagel market, estimated at $350 million, has an annual growth potential of 8 to 10 percent, according to industry sources.

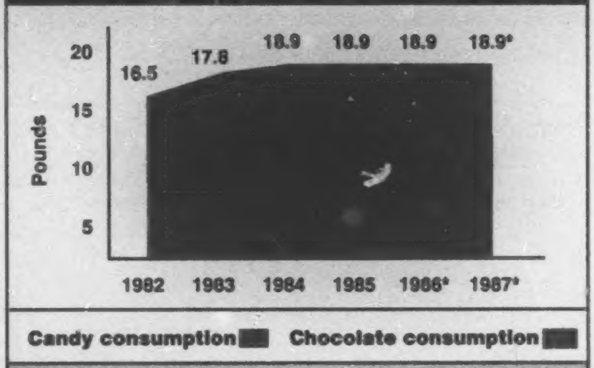
Shipments of "bread and related products...may rise only 1.2 percent after adjustment for inflation," in 1987, according to the Industrial Outlook; but "inflation adjusted shipments of cookies and crackers will probably increase 2.8 percent." At the same time, the forecast predicts a per capita decline in consumption of cookies to about 9.5 pounds while consumption of crackers will rise to 8.4 pounds.

A significant factor in sales of bakery products has been the growth of in-store "scratch" or "bake-off" bakeries. Pepperidge Farm refers to in-store bakeries as "major competition" and rightly so. An A.C. Nielsen survey of chain food stores revealed that 60 percent of those stores with $2 million and over annual volume had in-store bakeries of some kind. These fresh-baked products appeal to the quality-conscious, upscale shopper. Although a major portion of bakery foods are still purchased off the shelf, the in-store bakery is notable competition.

STATE OF THE FOOD INDUSTRY

CONFECTIONS & DESSERTS

Per Capita Consumption of Candy & Chocolate (in pounds)



Candy consumption ■ **Chocolate consumption** ■

*Estimated

Source: DAY, Inc., Chocolate Marketing, Inc., Godiva Chocolatier, U.S. Department of Commerce

The confections industry fared well in 1986. Product shipments of all types of candy reached an estimated $7.4 billion, up about 4 percent from the 1985 level of $7.1 billion, says the Department of Commerce. Industry sources agree.

The confections industry is poised, ready for future growth. The debate is whether the growth potential is there. Philip Kimball of the National Confectioner's Association points out that "per capita consumption has increased dramatically during the last five years, from 16.1 pounds to 18.9, but has shown a leveling off most recently." Kimball says "many manufacturers are viewing this as a breathing spell following a period of very rapid growth. You have to keep this in perspective."

The Department of Commerce does not agree and describes the outlook for confections as "not especially rosy," forecasting a decline in value of 3.5 percent in 1987 with total candy consumption expected to increase only a modest 1 to 2 percent. Per capita consumption will likely remain where it is, says Commerce. Look for increased market and new product development activities to try to spur consumption, says the U.S. Industrial Outlook, and also for diversification and acquisition within the industry to increase market share.

Present and future consumption of chocolate again spurred disagreement between the industry and the Department of Commerce. According to Commerce, per capita consumption of chocolate candy remained unchanged at 9.7 pounds. Sources within the chocolate industry, however, estimate the 1986 per capita consumption figure at 12 pounds. That's quite a difference.

Carmen Dubroc, Godiva Chocolatier's vice president of marketing, says of the Commerce Department figures, "I don't know where those figures are coming from. You can tell when the industry is flat; and if it were, there wouldn't be such a proliferation of new products."

Godiva's new line, *Barringer's*, represents what they see as a segment of the market with great potential—American chocolate. Priced in the $14 per pound range, Barringer's is a "giftable" line, but is geared to self-consumption, says Dubroc. This has not detracted from the Godiva line (priced in the super-premium range of about $21 a pound) because "it is a different consumer," he says.

Joan Steuer, of Chocolate Marketing Inc., shares Dubroc's enthusiasm. She sees a "large opportunity for American chocolate products that are upscale and all natural, along the line of the more traditional chocolates." Steuer calls these "homestyle, comfort" chocolates, such as turtles with macadamia nuts and cashews, or pistachio nuts in chocolate.

The super-premium imported chocolate market in 1986 was "not as strong" as previous years, reflecting maturity and a reaction to the value of the dollar that raised the cost of European chocolate considerably.

What's down the road in new products? Steuer sees white chocolate as being "very much of a trend...Nestle's *Alpine White* is the company's number two selling bar behind the *Crunch*."

Oversized, 3 ounce chocolate bars, "will be a growing market for U.S. manufacturers" says Steuer. And liquor-filled chocolates, as their manufacture becomes legal in more states, will become an increasingly popular item.

How about popcorn tossed with melted white chocolate and macadamia nuts? Already on the market are popcorn and potato chips covered, topped or tossed with chocolate.

The domestic chewing gum market, valued at $1.5 billion for 1986, reflects a "leveling off," according to Marshall Malloy at Warner-Lambert. "There really has not been very much in unit growth over the last three years." The sugarless variety, however, has grown by several percentage points per year, according to Malloy. Wrigley, entering this $800-million market with its *Extra* gum, has captured a 29 percent share.

Another growing area, frozen novelties, had a good year, according to A.E. Nielsen statistics, with 1986 retail volume growing 13 percent to $1.4 billion compared with 1985. Although it represented a 1 percent smaller increase than 1985's performance, 1986 numbers were still considered "a healthy volume." Total sales of novelties are estimated by Find/SVP to be at $2 billion, with an annual growth rate of 15 percent annually. The company expects the market for all novelties to rise to $4.2 billion by 1991.

DoveBar, Chipwich and frozen fruit juice bars continue to hold significant shares of the frozen novelty market. Find/SVP targets the fruit bar and frozen fruit cup segments as being particularly growth oriented, predicting an increase from $322 million in 1986 to $750 million in 1991. Why? Convenience, portion control and low price as well as providing nutrition, low calories, low cholesterol and good taste. Ice cream novelties are expected to grow from $953 million to $1.9 billion by 1991.

What's ahead? Says Joan Steuer, "More things like devil's food and brownie pudding. Yes, sleek, sophisticated products have their place, but the larger market is for old-fashioned, nostalgic things."

(Continued on next page)

STATE OF THE FOOD INDUSTRY

DRESSINGS AND SAUCES

(Continued from previous page)

As the national trend toward consumption of more nutritious foods continues, one area of the industry that benefits from a health-conscious consuming public is the the sauces and dressings industry. Salads continue to be a popular part of the American diet, consumed by children in school lunch programs, as well as teenagers and adults. Each serving of salad represents a serving of salad dressing, estimated at approximately one ounce.

The Association for Dressings & Sauces reports a 6 percent growth of the salad dressings and sauces industry in 1986 (figures do not include tomato sauces or condiments). Sales last year rose to 471.9 million gallons, which increased per capita consumption to 15.8 pints, up from the 1985 level of 14.9 pints.

All of this shakes out into a $1.5 billion retail market for sauces and dressings, says *Packaged Facts*, an informational industry newsletter, and the market is expected to grow to $1.9 billion in 1992, reflecting an annual growth rate of 4.3 percent. The $1.5 billion retail figure represents 45 percent of the total sauces and dressings market, conservatively estimated to be $2.756 billion.

Refrigerated dressings will see the biggest share of growth, estimated at 9 percent annually through 1992, or to $150 million, double its 1986 level, according to *Packaged Facts*. Pourable/spoonable/dry dressings will experience less than half that growth, estimated at only 4 percent.

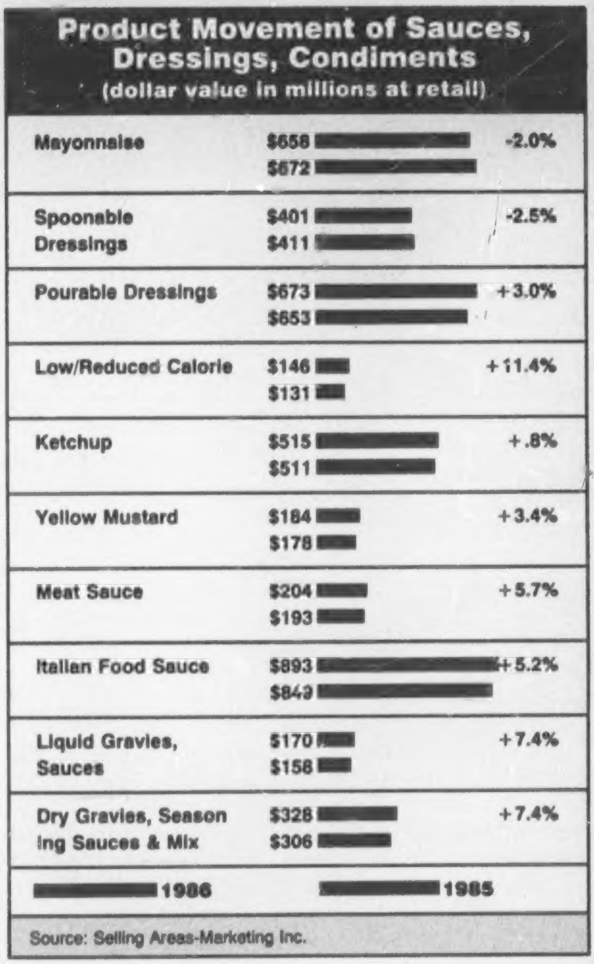
Low-calorie and reduced dressings accounted for $146 million in sales in 1986, says Selling Areas-Marketing Inc. (SAMI) and an annual tonnage gain of 11 percent over 1985, spurred not only by a health-conscious consumer, but by expansion of the flavors available.

Another area of growth: "snob appeal" dressings, such as champagne honey mustard, poppy seed, tomato dill, apple cider, lemon pepper vinaigrette, and a wide range of gourmet-type flavors.

Along with being more health conscious and snob conscious, a great number of consumers are also more sodium conscious, sparking increased use of low-sodium sauces and dressings. Business Trend Analysts estimates that approximately 1.5 percent of the total sauces and dressings market is in low-sodium products. This segment has shown steady growth since 1980 and is expected to continue to escalate into the next decade. Estimate for low-sodium sauces and dressings by 1995: 23 percent of the total market, or double its share in 1980.

In retail dollars, meat sauces and Italian food sauces prospered in 1986, the former showing growth of 5.7 percent, to $204 million in 1986, and the latter showing growth of 5.2 percent, to $893 million, according to SAMI. In this very competitive market there has been growth in non-red sauces (such as Alfredo and Pesto) that appeal to the upscale shopper.

Condiments are experiencing an exhilarating growth and it is a trend that is expected to continue. A.C. Nielsen estimates the 1985 market for all condiments, including gravies, sauces, ketchup, chili sauce, spaghetti sauce, mustards, etc., was $2.92 billion. The first half of 1986 saw a $1.5 billion sales figure, which includes some seasonality for barbecue sauces, etc. The 1985 market through food stores alone was $700 million.



Product Movement of Sauces, Dressings, Condiments
(dollar value in millions at retail)

Source: Selling Areas-Marketing Inc.

Mustards have become a hot item as health-conscious consumers use them to replace richer sauces. Yellow mustards alone grew 3.4 percent to $15.8 million in retail sales, according to SAMI. Mustards and other savory-type condiments are being used increasingly to enhance grilled foods.

Responding to a consumer preference for light sauces for fish and chicken is Lea & Perrins' White Wine Worcestershire sauce, according to the company. Distributed nationally, sales have been described by the company as "very encouraging."

Hot sauces are doing well, cashing in on the desire for trendy, spicy dishes. In 1986, according to SAMI, the hot sauce products category grew 6.1 percent to $49.3 million.

Edward Ogiba, managing director of Product Initiatives, a marketing research firm tracking new product introductions and innovations, describes condiments as "one of the fastest growing categories in terms of introductions...there is an area of opportunity there."

IS NATURAL BETTER?

Industry strives to meet consumer demand for convenient, fresh, and natural foods, while developing more shelf stable products according to FE's annual survey of ingredients buyers.

FOOD ENGINEERING'S
EXECUTIVE
ADVISORY
PANEL

The members of FE's Executive Advisory Panel represent a broad range of experience in all segments of the food industry. Through panel surveys, we are able to keep on top of the latest food industry trends.

JOYCE FASSL
Managing Editor

The increased use of natural ingredients and more shelf stable products are what *Food Engineering's* Executive Advisory Panel sees as the major trends affecting the industry in this year's annual survey of ingredients buyers. And the importance of these trends is expected to become even stronger in the next few years, according to the panel.

Food Engineering surveyed over 300 people across the industry, encompassing all segments of the industry, with respondents in a variety of positions and authority levels in companies of all sizes.

Survey respondents said that a trend to-

(Continued on page 98)

Product Development Influences Now and in the Future By Industry

1987 rating ▬
1990 rating ▬

	Total Panel	Meat	Bakery	Dairy	Flavors/ Food Ing.	Canned	Fats & Oils	Frozen Foods	Confectionery	Cereals/ Grains	Beverages	Other
Using natural ingredients	43.4 63.1	40.0 53.8	43.3 60.5	41.3 57.7	44.6 62.7	41.1 67.9	30.9 52.7	44.4 62.0	40.7 48.1	44.6 60.0	56.5 66.7	39.3 66.7
Lessening/eliminating preservatives	21.7 48.9	18.8 48.3	25.0 47.4	16.3 41.3	24.1 45.8	28.6 58.9	27.3 47.3	20.0 48.0	18.5 40.7	24.6 46.2	31.9 53.6	19.0 48.8
Vitamin fortification	12.3 23.6	13.8 23.8	11.8 22.4	16.3 26.0	13.3 22.9	14.3 26.8	14.5 21.8	14.0 24.0	11.1 20.4	13.8 16.9	11.6 27.5	15.5 29.8
Mineral fortification (particularly calcium)	11.7 26.9	10.0 21.3	10.5 26.3	21.2 31.7	10.8 26.9	12.5 35.7	9.1 20.0	14.0 30.0	16.7 27.8	12.3 23.1	11.6 31.9	16.7 32.1
Low & Reduced calorie foods	28.8 50.2	32.5 58.7	28.9 50.0	35.6 56.7	32.5 54.2	25.0 41.1	30.9 54.5	32.0 50.0	22.2 35.2	29.2 50.8	37.7 59.4	28.6 48.8
Reducing sodium content	34.4 48.9	40.0 53.8	27.6 43.4	39.4 58.7	32.5 60.2	37.5 53.6	29.1 52.7	36.0 56.0	25.9 40.7	27.7 47.7	37.7 58.0	[illegible] 44.0
Saturation level of fats	19.7 45.0	15.0 43.8	14.5 44.7	26.0 53.8	16.9 45.8	17.9 33.9	20.0 50.9	14.0 48.0	18.5 42.6	16.9 46.2	17.4 43.5	23.8 [illegible]
Reduced cholesterol content	22.7 42.7	17.5 51.3	19.7 44.7	30.8 53.8	21.7 47.0	17.9 35.7	20.0 45.5	16.0 52.0	20.4 35.2	21.5 40.0	23.2 43.5	29.8 47.6

Source: Food Engineering's Ingredient Survey 1987

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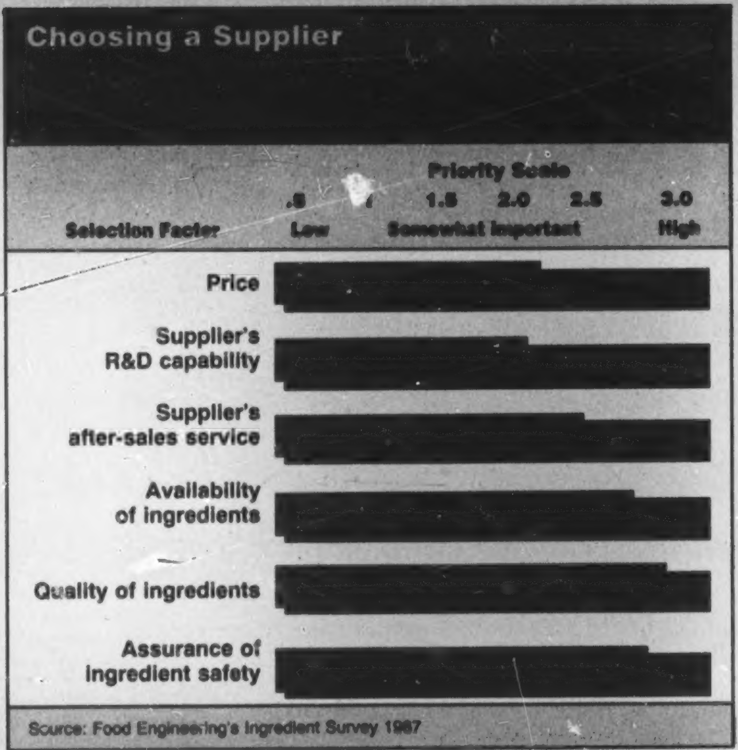
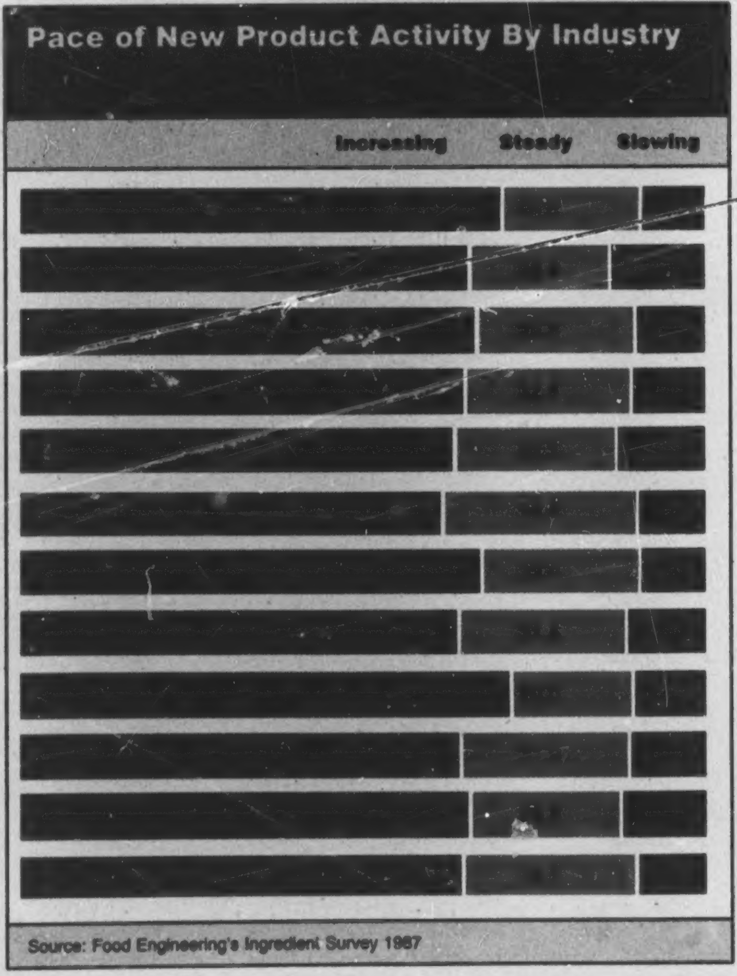


Choosing a Supplier

Source: Food Engineering's Ingredient Survey 1987



Pace of New Product Activity By Industry

Source: Food Engineering's Ingredient Survey 1987

ward smaller packages, products that have a "fresh and natural" appeal to consumers, and more up-scale products will be vital to the industry in the coming years.

But, as consumers are demanding more natural and fresh products, they also want convenience. The industry is responding to consumer demand by introducing more "natural type" foods, such as refrigerated foods, but is still searching for the right blend that will be shelf stable, yet still have that natural and freshness appeal consumers say they want.

As one senior vice president from California aptly commented, "Increasing demand for freshness and convenience – a contradiction in terms?"

FE's survey found that labeling and lack of consumer familiarity with ingredients may be misleading consumers into thinking "natural" food is better for them.

"Due to media hype, the artificial color and preservative issue has been blown out of proportion," said an R&D manager from New York. "The average consumer doesn't realize the extremely low level at which these are used in typical applications."

"With all the conflicting reports on color additives and sweeteners," echoed a VP from Iowa, "the job of the food industry should be to sort fact from fiction and educate the consumer accordingly."

And claiming we were touching a raw nerve, one panel member responded, "The food industry is guilty of perpetuating the natural is better myth. We have our problems, but the U.S. has the safest, widest variety of foods anywhere and no one appreciates this."

A research scientist from New Jersey agrees. "All natural is not always best or desired. B-carotene or citric acid on the label is not the end of the world. Our own industry seems to help perpetuate the myth."

No, it's not the end of the world. With the consumer demand for reduced calorie foods and shelf stable foods, and their demand for foods with freshness appeal and more natural ingredients, the food industry certainly has a tough task in the years ahead.

Decision making

Asked to rate a number of possible influences affecting ingredients and product development decisions at their companies, the panel rated the importance of each influence for both the present and for three years from now (1990), using a scale of 1 to 3. As the numbers below show, the importance of these influences is expected to increase in

(Continued on page 100)

the coming years.

The panel rated natural ingredients as the number one factor influencing decisions both now (2.37) and in 1990 (2.56). Next in line were reducing sodium content (2.13/2.34), providing low and reduced calorie foods (2.09/2.38) and lessening/eliminating preservatives (2.05/2.38). Mineral fortification, particularly calcium (1.64/1.91), was rated least important by the panel. Of the the eight factors given to the panel, the one that was predicted to grow in importance the most between now and 1990 was saturation level of fats.

Quality ingredients

Quality, not surprisingly, was of critical importance to *FE's* panel when choosing an ingredient supplier. On a scale of one to three, quality was rated 2.91 as a factor in ingredient decision making, the highest grade received by a factor for this question. Price was rated at only 2.16.

Close behind quality importance were assurance of ingredient safety (2.80), and availability of ingredients (2.74). Supplier's R&D capability received the lowest ranking for this question – 2.07, though it was still considered a factor of some importance.

Areas of concern

Salt substitutes are one ingredient area, the survey shows, that is of concern. Panelists ranked salt substitutes as needing improvement in both variety (2.45) and capability (2.41). Other areas where the panel saw problems in variety and capability were stable natural colors, fat substitutes, more stable flavors and low-calorie sweeteners.

In addition, the panel was asked to review a list of 24 ingredient categories and tell us in which areas they found problems in price, supply, and/or current technology.

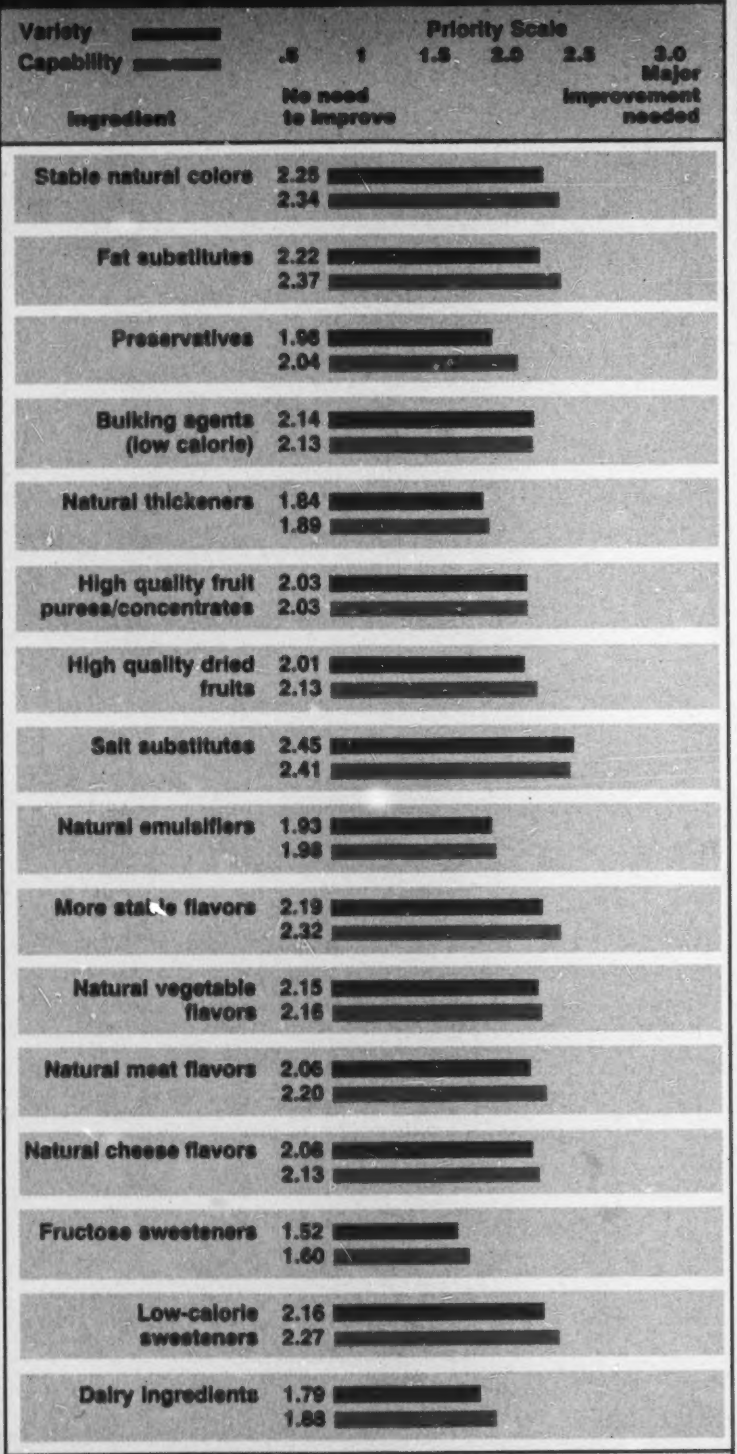
In general, supply was not a problem, with well over one-third of the respondents reporting none of the 24 ingredients had supply problems. But, the panel did find problems with current technology and, especially, price.

The price of natural flavors is a problem according to 35.9 percent of the panel, and 22.3 percent responded that the supply of natural flavors was also a problem. Seasoning and spices was the next highest problem area with 28.5 percent reporting that they had a problem with price and 17.8 having a problem with supply.

Price also showed up as a problem with cheese, gums, dehydrated fruits/vegetables,

(Continued on page 103)

Need for Improvement in Variety and Capability



Source: Food Engineering's Ingredient Survey 1987 cocoa, fats and oils, sucrose sweeteners, and vitamin supplements with more than one out of five panel members.

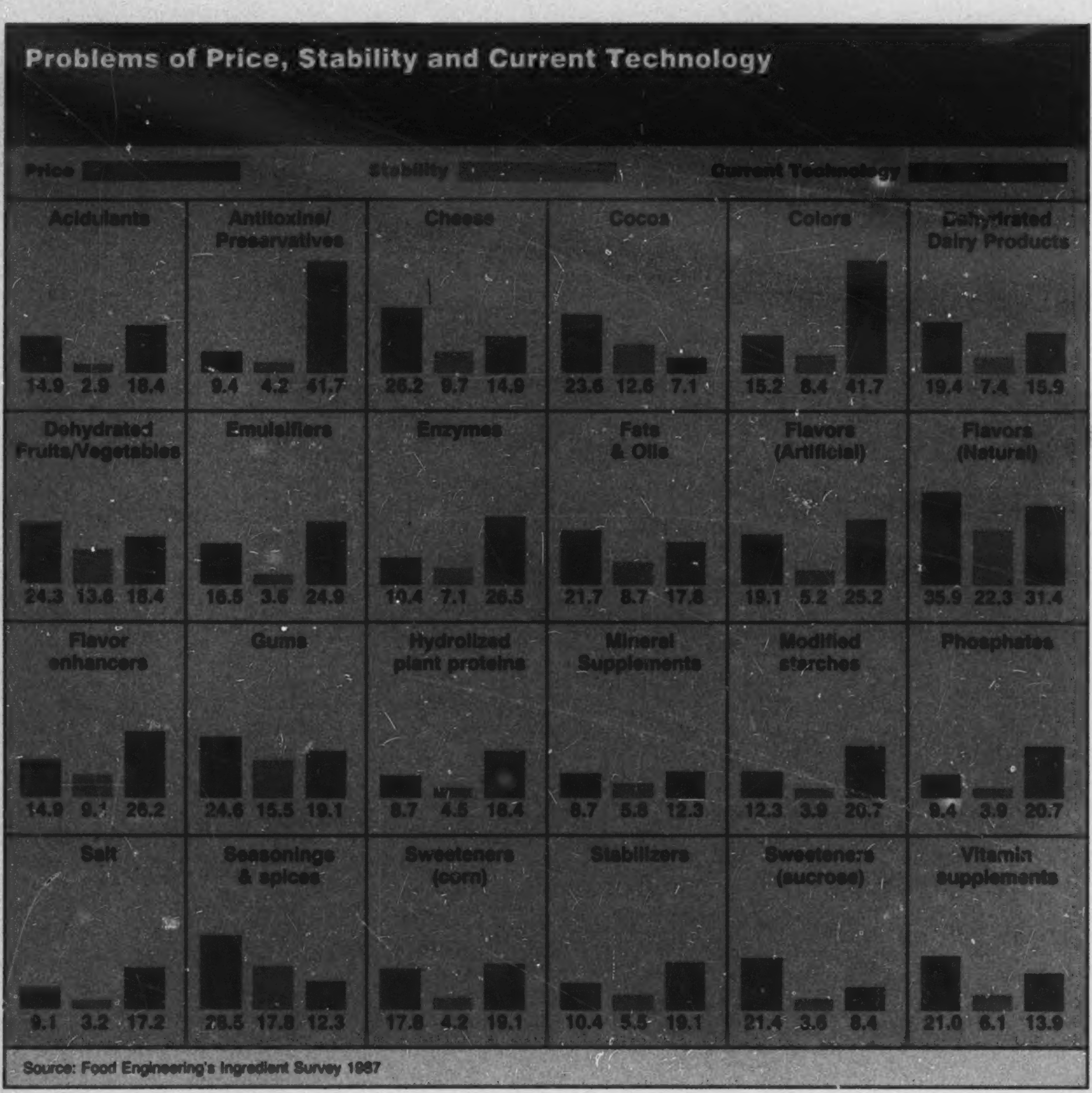
The third area of concern we asked about, current technology, found that over 40 percent of the panel had problems with both antitoxins/preservatives and colors. And close to 25 percent of the panel thought there were current technology problems with natural flavors, flavor enhancers, artificial flavors and emulsifiers.

In the offing

Asked to speculate a few years ahead the panel was given free reign with *FE's* survey to predict food industry trends in either product development or ingredient requirements.

The consumer demand for more natural and fresh foods was mentioned more than any other new trend. The second most-mentioned panel prediction was the increase in production of shelf stable foods.

More than half of those responding to the survey said their company will increase activity in developing new products in all areas. And in contrast to last year's survey that showed that most of the new product activity was expected to occur in larger companies, this year's survey results showed that new product activity is expected to increase in companies of all sizes.


Problems of Price, Stability and Current Technology

Source: Food Engineering's Ingredient Survey 1987

JULY 1987

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FOOD ENGINEERING

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Integrating Manufacturing

FOOD ENGINEERING

COVER STORY

Computer integrated manufacturing (CIM) gives large companies access to information that is usually only possible in small organizations.

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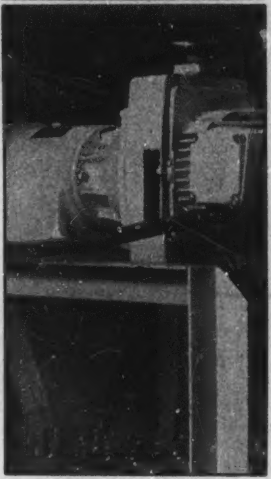

Special Emphasis

NEW DESIGNS FOR MOTORS AND DRIVES

Reliability and price are equally the most important factors in specifying motors for food plants and equipment.

Pages 65 to 69

NAS pesticide residue report raises controversial issues

A report on pesticide residues from the National Academy of Sciences says that the current law which judges residues on raw foods by a less stringent standard than processed, is difficult to implement and does not provide the best protection of public health. Instead, the report proposes a uniform, "negligible risk" standard applied across the board to old and new pesticides on both fresh and processed foods in order to virtually eliminate potential dietary cancer risks from pesticides.

NAS stressed that the report does not comment on the safety of individual foods. However, the report did list the 15 common foods presenting the greatest risk of cancer because of the presence of 28 pesticides, based on theoretical worst-case estimates. For example, 8.75 out of every 10,000 people eating tomatoes over a 70-year lifetime will develop cancer from residues. This is followed by beef (at 6.49), potatoes (5.21), oranges (3.76) and lettuce (3.44).

Dichotomy exists

The Environmental Protection Agency commissioned the report as part of an effort to evaluate current regulations, The EPA calls the report "sound" and will respond formally in about 90 days. In the report, the NAS panel states that a dichotomy between raw and processed foods does not make sense and recommends removing the Delaney Clause which applies a zero-risk standard only to processed foods.

The National Research Council committee which drafted the report used a "worst-case" scenario in evaluating possible dangers from the use of pesticides. Dr. John Moore, assistant administrator of the EPA pointed out

(Continued on page 19)

NAS Theoretical Worst-Risk List

Food Item	Risk Factor*
Tomatoes	8.75
Beef	6.49
Potatoes	5.21
Oranges	3.76
Lettuce	3.44
Apples	3.23
Peaches	3.23
Pork	2.67
Wheat	1.92
Soybeans	1.28
Beans	1.23
Carrots	1.22
Chicken	1.12
Corn	1.09
Grapes	1.09

**Number of people per 10,000 over a 70-year lifetime, who will develop cancer from residues in the food listed.*

A controversial report from a National Academy of Sciences panel, using theoretical worst-risk estimates, listed fifteen common foods that present the greatest risk of cancer because of the presence of 28 pesticides.

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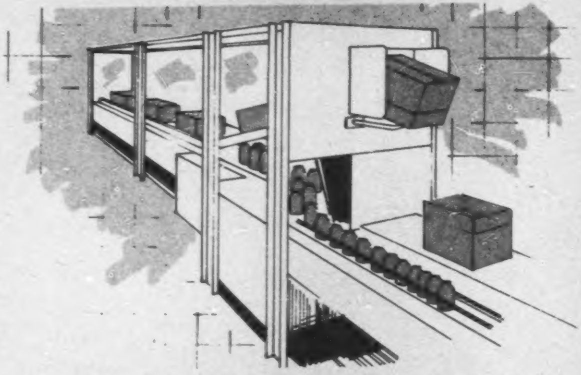

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Reduced calorie candies made without Sucrose

More Americans than ever before are using reduced-calorie foods, providing opportunities for new products in this area.

As Americans increase their efforts to maintain an ideal weight, the availability of a wide selection of low-calorie food products becomes important to them.

While 65 million Americans (or 37 percent of the U.S. population 18 and over) are on diets, 78 million Americans age 18 and over consume low-calorie products. This was among the findings of a survey commissioned by the Calorie Control Council (CCC), Atlanta, GA. Conducted last year, the survey entailed 1,402 completed telephone interviews.

More low-calorie food users

The survey also showed that the majority (53 percent) of low-calorie product users began using these products within the last five years (35 percent within the last three years).

Staying in better overall health is the primary reason for using low-calorie foods and beverages for nearly three-fourths of the women consumers interviewed. Other important reasons, according to CCC, are: reducing weight (mentioned by 72 percent), maintaining current weight (mentioned by 71 percent), and maintaining an attractive physical appearance (mentioned by 70 percent).

Other findings of the survey were:

- The four most popular methods of dieting among the total population are cutting out certain foods containing sugar, starch or fat; exercise; using light foods and beverages; and using low-calorie products.
- 77 percent of low-calorie product users consume diet soft drinks: 55 percent – sugar substitutes, 50 percent – sugar-free candy/gum; 35 percent – sugar-free puddings and gelatins; 9 percent – sugar-free cakes and cookies; and 31 percent consume "other foods and beverages that contain a low-calorie sweetener."
- The majority (53 percent) of users would like to see additional low-calorie foods and beverages available. The most-mentioned additional products are (in order of priority) candy/gum, cereal, cakes, cookies, ice cream, and beverages/drinks.

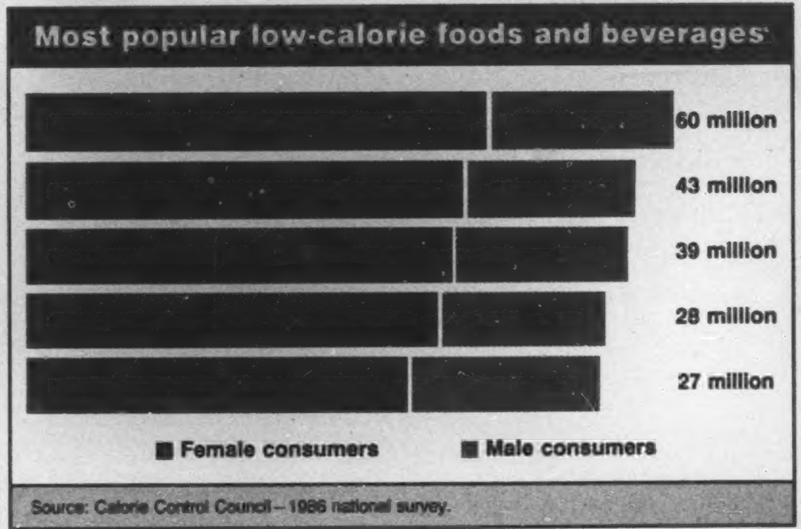
With the number of people consuming low-calorie foods and beverages almost doubling in the past eight years, and with low-calorie food consumers asking for additional reduced calories, new product opportunities are expanding.

To assist food manufacturers in taking advantage of these opportunities, Pfizer Chemical Div., New York, has developed formulas for reduced-calorie, lite candies and cough drops made without sucrose.

The hard, lite candies are made using a patented combination of Pfizer's polydextrose and hydrogenated corn syrup (see accompanying formulation). These candies have one-third fewer calories than regular hard candies.

Pfizer has an option to license the

Continued on next page



Most popular low-calorie foods and beverages

Source: Calorie Control Council – 1986 national survey.

Last year the Calorie Control Council commissioned a survey to be conducted of consumers attitudes about low-calorie, sugar-free foods and beverages. Above are some of the results.

(Continued from previous page)

patents. An added benefit is these candies can be made using conventional candy-making equipment with no additional capital investment required.

High consumer interest

A market study was conducted on consumer reactions after sampling these candies. Five thousand consumers sampled and rated prototypes of lite candy. The results showed:

- 70 percent would purchase lite candy,
- 88 percent rated flavor as good or very good,
- 84 percent rated sweetness as good or very good, and
- 97 percent rated texture as good or very good.

When 1,288 consumers were asked to agree or disagree with the statement, "I would prefer to eat sugar-free candy instead of candy containing sugar," 76.1 percent said they strongly agreed. The 1986 estimated sales for hard candy are 550 million lbs., 430 million lbs. for soft candy, and 390 lbs. for panned candy.

Another application for polydextrose and hydrogenated corn syrup blend is reduced calorie soft candy—such as popular chewy gummy bears or the traditional soft jellies.

A market study was also conducted to determine consumer interest in a lite cough drop:

- 77 percent of those who purchased sugar-based cough drops were interested in the lite product concept,
- 64 percent said they would buy such a product,
- 62 percent would be willing to pay a premium, and
- About half would switch brands in order to buy a lite product.

A company which has already taken advantage of consumer interest in this area is Louis Sherry Corp., Parsippany, NJ. Its *Reduced Calorie Hard Candies* come in a fruit assortment and contains eight calories per piece. "Sugar Free will not promote tooth decay" appears on the front.

For more information, contact Pfizer Chemical Div., 235 East 42nd Street, New York, NY. Or circle 287 on the reader service card.

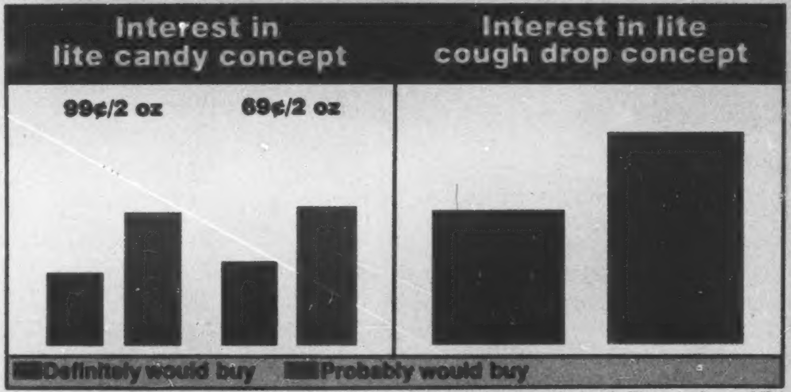
Reduced calorie hard candy

Ingredients	percent
Hydrogenated corn syrup (75% solids)	61.8
Polydextrose, powder (Pfizer)	37.8
Citric acid, anhydrous (Pfizer)	0.2
Flavor	0.1
Color	0.1
	100.0

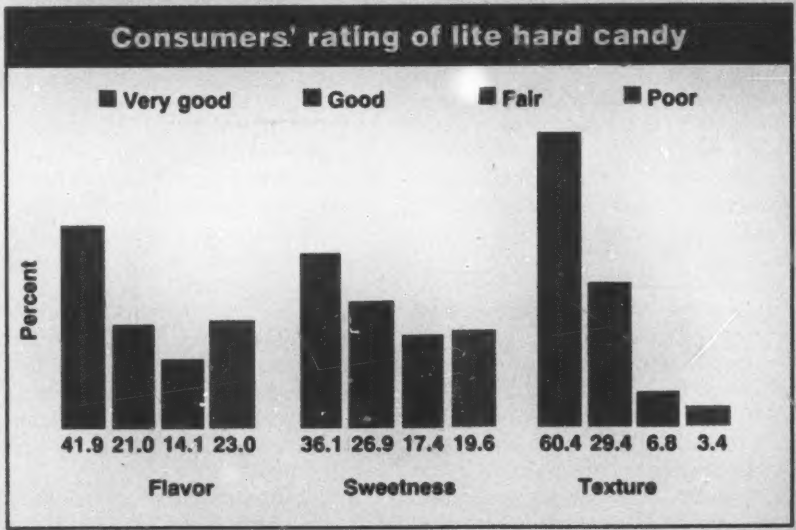
Procedure

1. Add the hydrogenated corn syrup and polydextrose to a vacuum cooking vessel and heat to 310°F at a vacuum of 29 inches.
2. Remove mixture from cooker and allow to cool to 250°F.
3. Add citric acid, flavor, and color to mixture and blend.
4. Transfer batch to a cold slab for further cooling. Knead until uniform.
5. Use conventional candy equipment to form finished pieces.

The above chart shows one of the formulas developed by Pfizer, Inc. which uses polydextrose in candies.



Consumer market research revealed high consumer interest in both lite candy and lite cough drop concepts.



1,290 individuals sampled lite hard candies made with polydextrose. How these consumers rated the candy's flavor, sweetness, and texture is shown.

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AUGUST 1987

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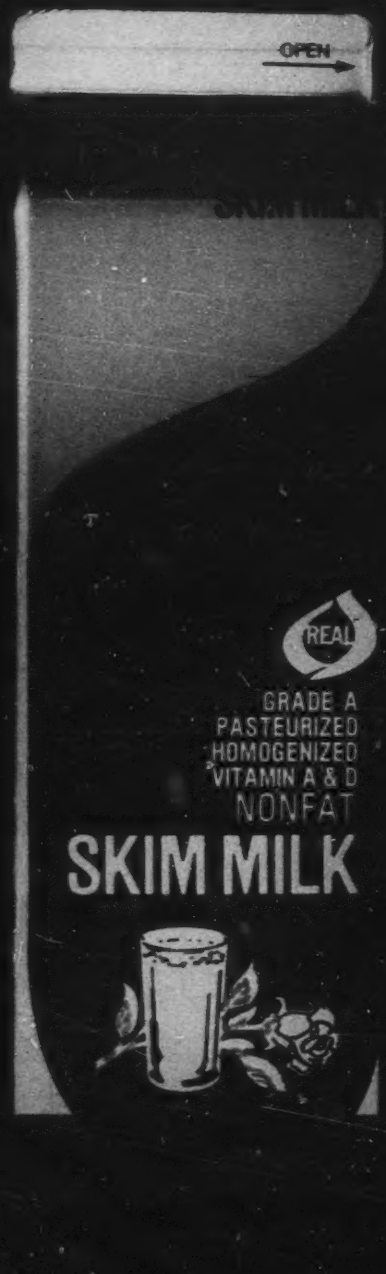
FOOD ENGINEERING

SINCE 1928: THE SOURCE ON PROCESSING, PACKAGING, AND PRODUCT DEVELOPMENT

FOOD SAFETY: IS PRODUCTION OUTRUNNING ANALYSIS ?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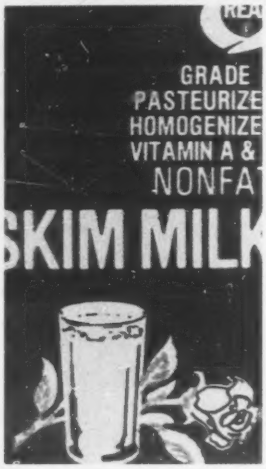

COVER STORY

Is food safety being compromised for production speed and efficiency? The federal government is taking a closer look.

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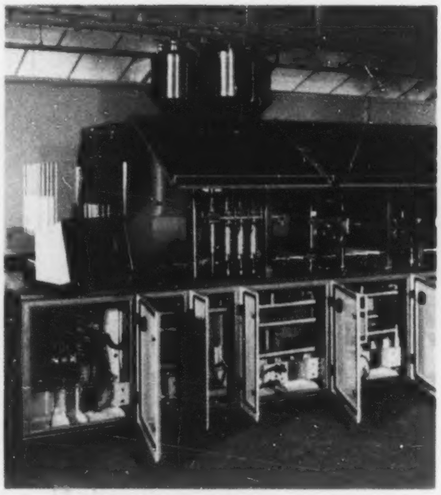

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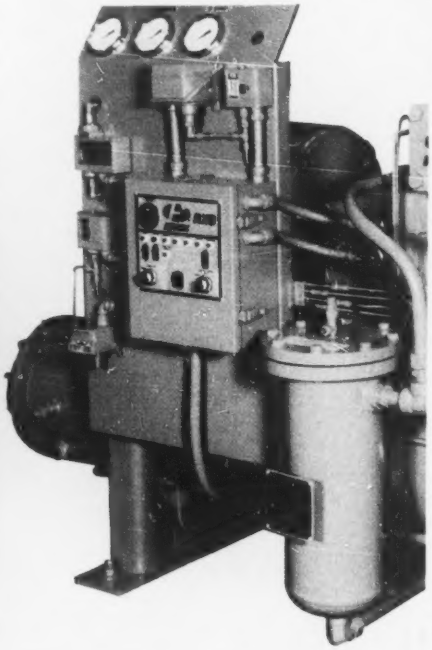

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Special Emphasis

COGENERATION: FUEL PROBLEMS SOLVED BY AN OLD TECHNOLOGY

Food processors are finding that yesterday's technology can offer a solution to one of today's problems: the rising cost of fuel.

Pages 105 to 112

Special Emphasis

COGENERATION

FUEL PROBLEMS SOLVED BY AN OLD TECHNOLOGY

Cogeneration, once a dying industry that seemingly had had its day, has become a solution to the problem of rising energy costs.

Food processors, large and small, are finding that yesterday's technology can offer a solution to one of today's problems: the rising cost of fuel. Fuel prices have increased an estimated sevenfold during the past decade, and further increases have the same inevitability as death and taxes. Cogeneration provides a viable alternative for the food processor, a heavy user of electricity and thermal power, to fill his energy needs in a cost-effective manner, while decreasing his dependence on others for his energy needs.

Cogeneration is the simultaneous production of electrical or mechanical power and thermal energy from a single fuel source. A cogenerator is able to realize enhanced efficiencies because his system uses the same fuel sequentially to do work twice. The first use is in the engine to produce power. The second use is hot water or steam used for heating or cooling purposes. So, for the same amount of fuel, the cogenerator, while he may produce less electricity than a central power plant, will produce more useful energy overall.

"Cogeneration," says Ken Fuginelli of the American Gas Association, "saves energy, cleans up the air, and offers overall thermal efficiency higher than with conventional utilization of energy, thus making better use of natural resources. Cogeneration gives you a lot of flexibility – the flexibility to tailor a system to fit your individual needs."

Typical applications

There are three basic applications of cogeneration technology: industrial, geothermal and waste-to-energy.

Industrial cogeneration usually uses a system where power generation precedes heat generation. Fuel is burned that produces steam, and the steam is expanded through a turbine driving a generator. After passing through the turbine, the reject heat is used to provide process steam.

Food processors are sometimes able to fuel their systems with a wide variety of non-conventional fuels, byproducts of their own operations. (Approximately 44 percent of cogeneration facilities in operation are natural gas-fired, due to much lower installation and operating costs.) However, rice hulls, walnut shells, waste from paper and chemical production, and other processing byproducts are being used around the country to fuel cogeneration systems. Although the economics of a cogeneration project cannot be based on using such unusual fuels, it can add to the feasibility of the project. Just remember: you have a lot of waste to fill significant thermal requirements.

Geothermal applications are used to cost-

(Continued on next page)

The Sunkist Growers facility in Ontario, CA is the site of an 11.2 MW cogeneration facility which supplies both steam and electricity to the plant. Excess electricity is sold to the local utility. (Source: International Power Technology).

LINDA K. FREEMAN
Contributing Editor

(Continued from previous page)

effectively and efficiently secure the highest rate of return from a production well by making the best use of steam.

Waste-to-energy cogeneration employs mass-burning technology using untreated municipal solid waste (MSW) or refuse-derived fuel (RDF) to produce the steam that powers the steam turbine-generator. Regenerative feedwater heating is often used to improve overall cycle efficiency.

The area of waste-to-energy systems is, according to Tom Eidon of Transamerica Delaval, "a brisk market." Transamerica Delaval supplies turbine generator sets and, says Eidon, "more than half of our activity is now in MSW." Why? Because people never stop generating waste. Using MSW as a fuel source for a cogeneration system is a logical way for local communities to get rid of waste.

Cogeneration's appeal has been wide as users of large quantities of electricity and process steam have seen the economic advantages of cogeneration, causing a "rebirth" of the technology. Food processors have found cogeneration brings a number of advantages, including:

- An increased fuel efficiency of up to 50 percent over the separate production of electricity and steam.
- Containment of future energy costs.
- More effective use of energy resources.
- The ability to reduce pollution, since less fuel is required to produce the same amount of energy.
- A lessening of dependence on the utility for power.

Why is it more economical?

In the U.S., most of the electricity produced by utilities is in steam cycle plants. Fueling these plants is coal or nuclear fuel with varying requirements for other fuels such as oil, natural gas, hydro, etc. Depending on the plant's location, the fuel mix will include varying degrees of oil and natural gas.

In operation, today's basic steam cycle plant has a fuel to power efficiency of about 35 percent. This means that there is a great deal of waste involved. While fuel to power efficiency is improving, current technology in utility-produced electricity still loses three-fifths of the energy of the fuel input. Another ten percent is lost in transportation. This means that overall about one-third of the energy in the fuel delivered to a central power plant ends up being delivered as electricity for use. The rest is lost.

Cogeneration, however, offers a total system efficiency of 80 percent or more. In a typical cogeneration system the engine is usually used to drive an electric generator. An efficiency ranging from 25 to 30 percent is realized when the fuel is converted to electricity. However, where the utility experiences energy waste because a portion of the fuel goes "up the stack," the cogenerator captures that energy and uses it to satisfy thermal requirements. Up to 50 percent or more of the fuel energy goes to this air cogeneration, making the system 80 percent or more efficient.

Determining factors

An efficiency rating of 80 percent sounds awfully good to a food processor, but cogeneration does not *always* produce power and heat at the lowest possible cost. A lot depends on location. In some parts of the U.S. inexpensive power is available and there is sufficient excess generating capacity to indicate that low-cost power will continue to be available. In these areas the life cycle cogeneration costs may be greater than the cost of using conventional utility services. Also, if the cogenerator cannot effectively use both the steam and electricity produced by this system, then cogeneration does not make sense for this operation.

Cogeneration *does* make sense when electricity costs are high, and continue to increase, when low-cost byproduct fuels or renewable resources are available, or when there is a good match between heat and power requirements. In some cases the payback period for a cogeneration system can be two years, for others five to ten.

It also makes sense in areas of the country, such as the Northeast, where utility rates are high and where some nuclear plants have not come on line, or have even gone off line, affecting capacity. In areas such as this where there is no excess capacity, but rather a need for increased capacity to fill industrial and consumer needs for power, cogeneration is viable.

Legislation spurred cogen

One factor that had a major impact on making cogeneration a wise choice for food processors and other quantity energy users was the passage, in 1978, of the National Energy Act, a series of laws enacted by Congress to encourage better management of U.S. energy resources. Part of this legislation was the Public Utilities Regulatory Policy Act, or PURPA.

PURPA contains specific provisions designed to encourage cogeneration. Under

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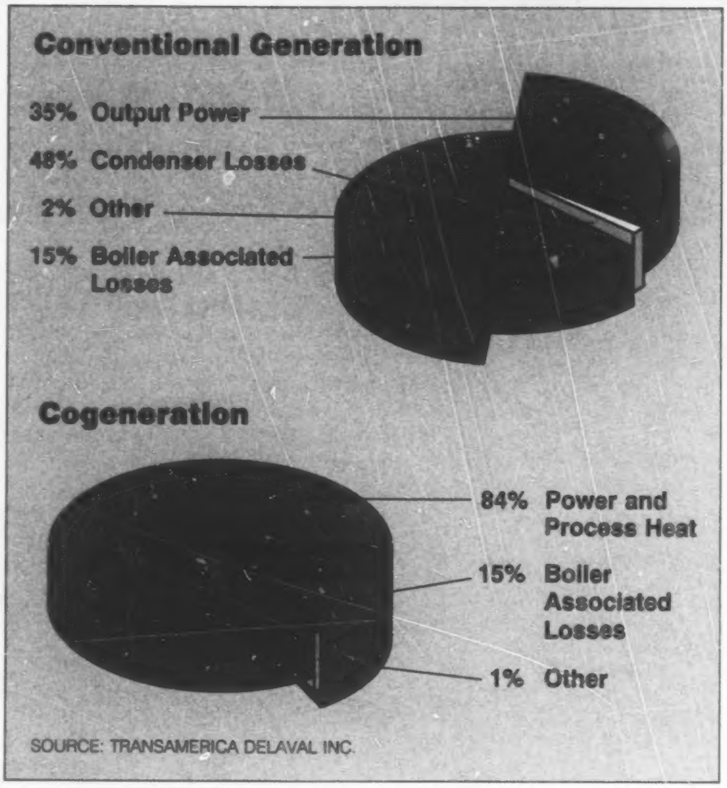

SOURCE: TRANSAMERICA DELAVAL INC.

The efficiency advantages of cogeneration become immediately apparent when compared with conventional power generation.

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PURPA, utilities are required to (1) purchase excess electric power generated by cogenerators at fair prices; (2) provide "standby" or supplemental power to cogenerators; and (3) allow cogenerators to interconnect with the utility grid.

Part of the legislation was that the electric utility would pay the cogenerator all of the cost that the utility would have incurred if it had produced the power itself or purchased it from another utility. This is known as the "avoided cost."

Some utilities are now more cooperative with cogenerators. This varies from region to region, utility to utility, state to state. For example, says Jeff Fisher, of Transamerica Delaval, "In New Jersey, Jersey Central Power and Light needs to purchase excess cogenerated power to supply its customers. In Houston there is enough reserve capacity that they don't need energy produced by cogeneration." The State of New Jersey has formed a separate entity called "Energy Initiatives" to encourage cogeneration and work in concert with companies who are considering the cogeneration technology for their operation.

The ability to negotiate a satisfactory price for excess cogenerated power can make the difference between an installation being economically wise or economically imprudent, but it is something that varies from utility to utility. What is economically viable in one region may not be feasible in another.

The ability to sell power back to the utility can be a determining factor in the economics of the cogeneration system. Where long-term agreements between the cogenerator and the utility can be negotiated, the avoided cost revenues become substantial and can be used as a determining factor in the overall economics of the project and in securing project financing.

The requirement of the utility to supply standby or supplemental power is of equal importance. This means that today's cogenerator does not have to be able to provide *all* of the power required by his operation. Instead the cogenerator can design his on-site system to provide the base amount of power he needs, then use the utility for the rest of his requirements.

Both of these factors, however, vary across the country because each state applies PURPA and the other regulations individually. There is no standard implementation of legislation across the U.S.

"PURPA seems to me to have worked in large measure," says Tom Mason, director of planning and ventures of Energy Factors, a company that develops, finances, engineers, constructs, owns and operates cogeneration facilities.

"Of course," says Mason, "it just provides rules and regulations for the states to implement and it would be desirable if the state implementation of those rules and regulations were consistent – and they are not. It goes according to that state's particular set of problems." Mason feels that one solution to the inequity across the country would be greater involvement by FERC, but that would also infringe upon the state's individual rights.

To reap the rewards of the legislation contained in the National Energy Act, a cogenerator must fulfill certain requirements and become a Qualifying Facility (QF). In order to become a QF with Qualifying Status (QS), a cogenerator must provide two useful forms of energy, thermal and power. FERC has established guidelines for the cogenerator detailing the requirements for certification.

Is it viable?

Determining whether cogeneration is a logical pathway for a food processor is not a simple task. An in-depth engineering sur-

(Continued on page 110)

Filling the processor's fluctuating steam needs

An 11.2 MW cogeneration facility supplies energy to the Sunkist Growers, Inc., Ontario, CA facility, powered by two Cheng Cycle Series 7-Cogen systems. Each Series 7-Cogen system produces up to 5.6 MW of electricity or 45,000 lbs/hr of steam.

The Cheng Cycle, is designed specifically for users whose steam requirements show peaks and valleys in demand. The system employs precisely controlled steam injection to boost cogeneration output and fuel efficiency. In operation, superheated steam is injected into a turbine combustion system to increase overall turbine mass loadings without raising inlet temperatures.

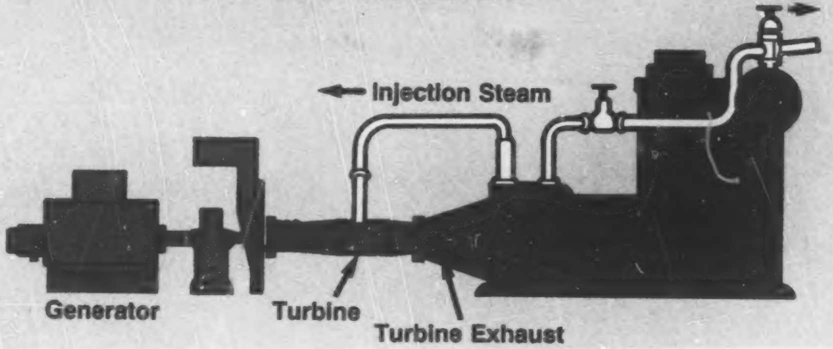
What made the use of the Cheng Cycle systems the logical choice was the plant's fluctuating need for steam. The plant processes fruit year-round, but season-to-season steam loads vary significantly, ranging from nearly zero to a maximum of 80,000 lbs/hr during peak demand periods.

Sunkist uses the steam from the plant to produce citrus concentrate and to fill space heating requirements in the processing plant. The system also supplies Sunkist's electrical needs, which range from 3.5 to 6.8 MW. Excess electricity is sold to the local utility. It is expected that with the installation of the facility Sunkist will see about a 10 percent savings in energy costs—not a tremendous amount, but sufficient enough to make the project a viable one.

The system was installed by International Power Technology who entered into a sale/leaseback leveraged lease transaction with Citicorp Industrial Credit (CIC). Union Bank provided construction financing and long term credit support. A wholly owned subsidiary of IPT is now leasing the facility from CIC through 1999. Sunkist reaps the economic benefits of lower steam plant operating costs and a portion of the cogeneration profits.

In the Cheng Cycle (shown below), steam is injected into the turbine to increase efficiency by as much as 40 percent and power by as much as 60 percent. The amount of steam injected can vary from minute to minute, depending on steam loads and electricity buy-back rates.

CHENG CYCLE EQUIPMENT CONFIGURATION AND OPERATING REGIME



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vey is necessary to look at present needs and the potential for the future. The engineering study would include four basic parts: site conditions, utility information, economic assumptions and engine specifics.

In addition, says Mason of San Diego-based Energy Factors, there are three analyses that must be performed: An economic analysis, a sensitivity analysis and a risk analysis.

To conduct an Economic Analysis, says Mason, look at the revenues produced by the facility from electrical and thermal sales, and subtract from them the costs for fuel, operation, maintenance, insurance, property taxes, and other costs of with the project, such as financing costs and tax considerations.

To accomplish the Sensitivity Analysis you need to vary the key components involved, such as fuel costs, interest rates, electric power rates, steam share rates, inflation rate, etc. to see how the economics react to those changes. "This," says Mason, "gives you some assurances that, given the uncertainty that lies ahead in the components, within ranges, that your project doesn't become unprofitable."

The Risk Analysis looks at those risks in the project that might stand in the way of the ultimate completion of the project—factors such as environmental permitting, financial permanency, tax considerations. "This gets very site specific," says Mason.

As mentioned before, each project has its own special needs and requirements that vary with states, sites and utilities. There are, however, three forms of ownership of a cogeneration project: industrial, third-party or utility.

(Continued on page 112)

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Knowing the obstacles (permitting, taxes, financing) and having the experience to overcome them is why a lot of cogenerators turn to a third party for help. "We have been through these things so many times so we know what risks we are looking for and how to evaluate them," says Tom Mason.

Third party companies, such as Energy Factors, and Solar Turbines of San Diego, offer the advantage of years of cogeneration experience. Solar Turbines, a subsidiary of Caterpillar, Inc. designs and produces completely integrated turbomachinery packages and systems. Through its sister subsidiary, Caterpillar Capital, the company offers third party services, such as ownership of the cogeneration facility, management services, engineering, purchasing and maintenance.

There are as many ways to structure a cogeneration facility agreement as there are kilowatts. Susan Brauer of Solar Turbines puts it this way: "We can take responsibility for the entire project. Some companies want to use their own people, others want to use an outside company to maintain and operate. Our prime concern is that the project work and the customer is getting what they want."

Third party development presents a good option according to Walter Thurston, marketing communications manager at International Power Technology (IPT). "It takes away the risk for the food company." Thurston says. "The food processing industry has not been in the business of selling power, so many managers realize it makes sense to have someone else take care of that." He estimates that half of cogeneration projects are third-party projects.

Selling back the power to the local utility, or negotiating the "buyback" agreement can be crucial to the success of a cogeneration project. Often the experience and knowledge of having dealt with the utilities and knowing how best to negotiate with them is another factor that makes the use of a third party an important consideration.

Some food processors, however, want to do it themselves, particularly those with large operations who can afford to handle the financing, maintenance and operational expenses themselves. Often these companies have the strength to effectively negotiate an agreement with the local utility.

Ken Fuginelli, vice president of marketing services for the American Gas Association, cites Campbell Soup as an example. "If you are a large cogenerator such as Campbell Soup, you will be able to generate a sizable capacity yourself and then buy the rest (from the local utility). You can cogenerate your base load and buy your peak load."

You don't have to be the size of a Campbell Soup, however, to make cogeneration pay off. Although smaller cogenerators might have a longer payback period or might not realize quite the same return on investment as a larger cogenerator, that is not to say that the economies are not there.

However, with the availability of smaller scale cogeneration units, more and more smaller processors are finding this century-old technology can work for them. By installing a system that can provide their base load electrical needs (purchasing power from the utility only at peak times), a processor can also fill his processing steam needs or fuel his refrigeration facilities independent of anyone else.

There are a number of package cogeneration systems available that will supply heating, air-conditioning and hot water all coming out of one unit. A pad is laid next to the building or on the roof, then the system is placed upon it. It's simple, and efficient. McDonald's restaurants have made use of such systems not only to fill their electrical demands, but using the hot water supplied to satisfy the restaurant's needs, and using the heat generated to keep the restaurant warm in winter.

Prepackaged systems "are coming more and more into vogue," says Fred Rambert, production manager at Waukesha Power Systems. "The problem is that it usually costs more dollars per kilowatt than with the large package. It usually takes almost as much engineering and design work for a small unit as it does for the big ones."

The future

The future looks optimistic for cogeneration. Although the Tax Reform of 1986 took away some of the tax advantages for cogenerators (including loss of the Investment Tax Credit), this should not significantly affect the viability of a project. "If you were in it for the tax advantages, you weren't very smart," says Waukesha's Rambert.

The number of requests for certification submitted to the FERC points to the "brisk market" mentioned by Tom Eidon of Transamerica Delaval. It is a market that should continue to grow. The legislation is there to encourage it, utilities are becoming slowly more receptive to it, and more and more industrial operations are realizing the economic value of generating their own electricity and thermal power.

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FOOD ENGINEERING

COVER STORY

Technological breakthroughs in packaging have allowed food processors to produce higher value-added products that satisfy consumer demands and provide processors with a better bottom line.

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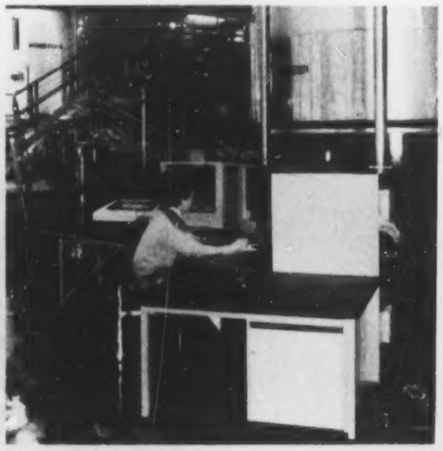

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New source offers 80 percent total dietary fiber, includes both soluble and insoluble fibers.

56 Alginate
Almost any food material that can be pulped can also be restructured, or in equivalent terms, recombined or reformed.

60 Dual Viscosity
Food scientists can formulate for optimum processing and consumer appeal.

63 Looking Ahead
64 Literature

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New Equipment

152 Processing Equipment
160 Packaging Equipment
162 Instruments/QC

From the Field

135 Surimi-products plant starts up in Minnesota.
141 Fluid bed recovers heat from waste, process streams without fouling.
142 Distributed control system replaces previous corn miller equipment.
144 Implementation of food industry maintenenace systems.
146 Program gets employees involved in cost cutting methods.

SURIMI PASTE: PAGE 135

On-Line HPLC Analyzer

Special Emphasis

EQUIPMENT FOR BIOTECHNOLOGY WORK ON THE INCREASE

With more and more products being developed through the use of biotechnology, testing needs will continue to grow.

Pages 125 to 132

Impact of science and technology on EEC food industry studied

Impact of processing methods by the year 2000

	None	Slight	Moderate	Major	Total Replies
Aseptic processing	0	1	18	25	44
Irradiation	0	11	18	15	44
Gas/modified atmosphere packaging	2	2	22	18	44
Microwave/RF heating	0	3	21	20	44
Ultrafiltration/ reverse osmosis	0	10	17	17	44
Extrusion cooking	0	5	23	16	44

Some of the conclusions of the FAST Study, conducted for the Directorate-General for Science, Research and Development of the Commission of the European Communities, indicate that the above processing methods are expected to have between moderate and major impacts on the food industry by the year 2000.

In a report to the Directorate-General for Science, Research and Development of the Commission of the European Communities, the Forecasting and Assessment in Science and Technology Programme (FAST) studied "The Impact of Food Science and Technology on the EEC Food Industry in the Next 10-15 Years." In the study, over 60 members of the Leatherhead Food R.A. were canvassed for their views on the subject. The study's purpose is to allow industry and government to plan ahead and obtain maximum benefit from scientific and technological knowledge by acquiring information on likely future trends.

Findings of the study

The major findings of the study are:

- Technologies forecasted to have a major impact by the year 2000 are process automation, biotechnology in the agricultural sector, process design, microelectronics and new packaging materials/concepts.
- Forecasted to have a moderate to major impact are biotechnology specific to the food industry, gas/modified atmosphere packaging, aseptic processing, microwave or radio frequency heating, extrusion cooking, new sensors and mathematical modeling.
- There will be a continuing and sharp decline in the usage of synthetic colors and flavors, while use of natural materials will continue to rise. Emulsifiers/stabilizers, flavor enhancers and sweeteners will remain comparatively unaffected. Use of preservatives should decline slightly.
- There will be a move towards the manufacture of food additives by biochemical means as opposed to the traditional chemical means.
- Consumption of what can be termed fresh/chilled foods will nearly double by the year 2000, while consumption of frozen foods will rise by about 25 percent. Canned foods should decline about 25 percent.
- Employment levels in the EEC food industry are forecast to decline 25 percent by the year 2000 because of scientific and technical development.
- EEC policies forecasted to exert a moderate to major influence by the year 2000 include lifting of trade barriers within Europe and regulatory policy, e.g. standardization of labeling/food composition.
- High R&D priority levels should be given to biotechnology, nutrition and health properties of foods and microbiological control.
- Issues posing a major problem by 1990 include overfishing and environmental pollution. In the long term, aging population, need to conserve resources and shortage of raw materials are seen as major problem areas.
- Irradiation is forecasted to have a medium to major impact by the year 2000, particularly in the areas of microbiological control sterilization of packaging materials, increasing shelf-life of fresh produce and pest control in commodities/raw materials.

The study concludes that over the next 15 years, food science and technology will have great impact at the manufacturing, product and social levels, resulting in more efficient production of foodstuffs and offering improved levels of quality and freshness.

For additional information, contact The British Food Manufacturing Industries Research Association, Randalls Rd., Leatherhead, Surrey, England KT22 7RY.

New tax law could disrupt distribution

Making inventory a taxable item as income for manufacturers and retailers, the 1986 Tax Act may cause imbalance in the food distribution chain, predicts Robert Estes, partner, tax department, and national director for the food industry and cooperative industry at Touche Ross & Co.

If a manufacturer has taxable inventory at the end of a fiscal period, food brokers may be called upon to sell the product so that the principal avoids paying the tax. The retailer may also be attempting to minimize inventory, making sales difficult and disrupting a smooth flow of goods.

Estes explained that the new tax laws will change the tax rates for both individuals and corporations. With the new tax reform, the upper bracket for individuals will be 28 percent and 34 percent for corporations. Some previously tax-exempt items and tax shelters have been eliminated.

Labuza named IFT President

Dr. Theodore P. Labuza has been elected the 1988 President of the Institute of Food Technologists, the 23,000 member professional society of food scientists.

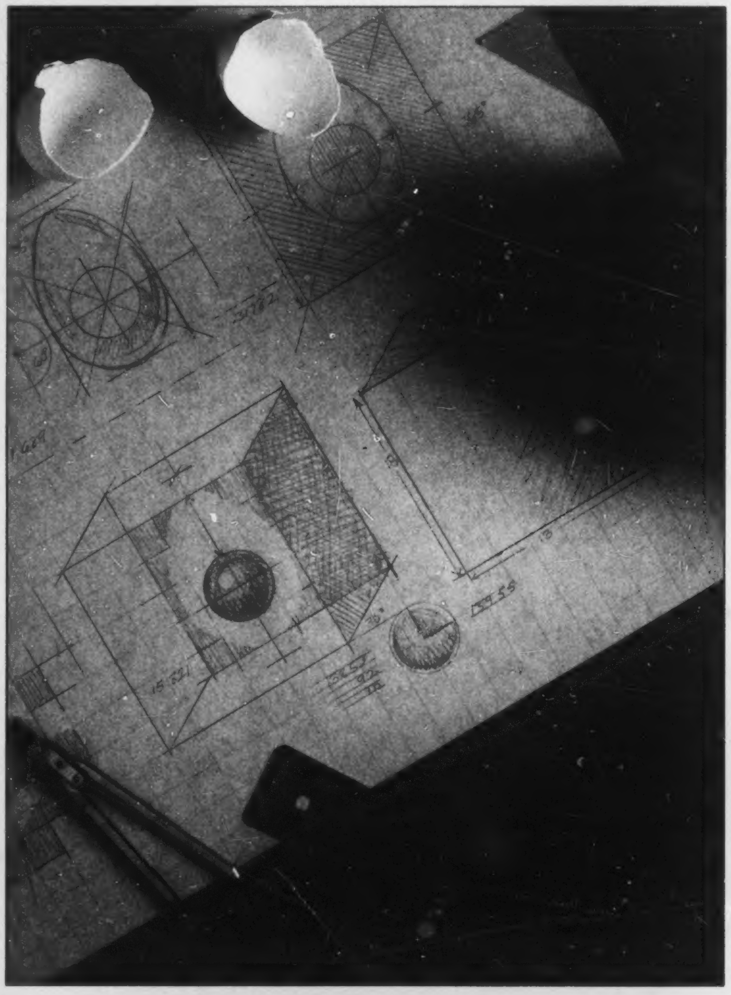
Now at the University of Minnesota, Labuza's major research concerns the properties of water and how they interact with processing, packaging and storage stability of foods. Other research interests center on the basic physical chemistry and kinetics involved in the shelf-life of foods and the biotechnology of the production of food flavorings.

Labuza will take office as IFT's 49th president on July 1, 1988.

PACKAGING REPORT

COPING WITH THE PACKAGING EXPLOSION

Technological breakthroughs in metals, glass, paperboard, composites and especially plastics are providing a multitude of opportunities for improved food packaging.



Consumer demands for convenience and quality in foods have fallen on fortuitous times. Technological breakthroughs in packaging have allowed food processors to produce higher value-added products which satisfy consumer desires, while providing processors with a better bottom line.

According to Dr. Melvin Druin, vice president/packaging of the Campbell Container Co., Moorestown, NJ, "The issue is that today, packaging is significantly more important, in terms of being able to sell a food product. It had a function 5-10 years ago in terms of being able to deliver a safe product, but now we're asking it to do a lot more. We're challenging the materials to provide more utility."

The catalyst for packaging advancements has been plastic. As Curt Funke, manager of package engineering for Sara Lee puts it, "Plastics offer us a lot more alternatives in the packaging area because they are easy to automate. They can be formed into a variety of shapes. They provide multiple types of barrier qualities. They can be heat sealed for tamper evidence. They can be gas flushed or vacuum packaged to provide a different atmosphere to increase shelf life or to sell the product in a refrigerated rather than frozen state. In addition, plastics can be used on most of our processing or make-up equipment."

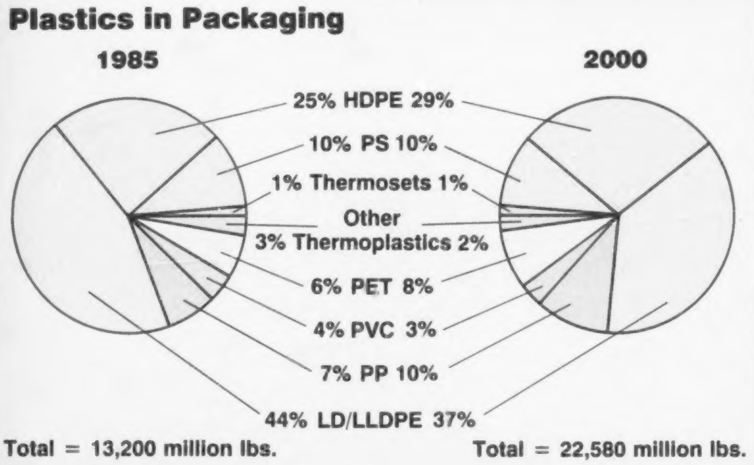
Food packaging growth

Studies do in fact show plastics to be the fastest growing segment of a burgeoning packaging arena. In a report entitled *Processed Foods Packaging,* FIND/SVP, a New York-based business information and research firm predicts that sales of food and beverage packaging will rise from $29 billion to $43 billion by 1990, with plastics rising from a 13.8 percent to a 17.1 percent share. In contrast, metal cans are expected to decline in market share from 37.6 percent to 36.9 percent; glass containers, from 14.7 percent to 12.4 percent; and paper, foil and composites, from 31.6 percent to 30.9 percent. Another study from Business Trend Analysts, Commack, NY, also shows rapid growth for plastics.

Two things have worked together to push plastics to the foreground. First, several alternative high barrier plastics have been developed, including PVDC, EVOH and various nylons and polyesters. The second development is the ability to economically

(Continued on next page)

WILLIAM C. DRENNAN
Senior Editor



According to The Society of the Plastics Industry, an average annual volume growth rate of nearly four percent is forecast for plastic packaging material through the year 2000, increasing usage to 22,580 million lbs.

(Continued from previous page)

coextrude various polymers together. Burton Lundquist, director of technical services and manager of packaging for Armour Food Co., says, "Coextrusion provides an opportunity to put materials together in a more efficient, lower cost system and it provides an opportunity to put them together much differently than when we were just laminating. Because of that, use of EVOH is going to continue to expand."

These developments, coupled with new processing and preservation techniques, such as the ability to retort plastic containers, aseptic processing, and modified or controlled atmosphere packaging, have changed basic product thinking. According to Richard M. Frisosky, Packaging Manager for General Foods, "Packaging is inseparable from new market opportunities." Funke agrees, "Because of the new packaging technology available, there's a lot more opportunity for us to sell to a wider market of the retail segment of the store than we've ever had before."

Plastic packaging

Plastic packaging is a complex market – and a burgeoning one. Total consumption of plastic bottles, film and other packaging materials grew in a decade more than 300 percent, from $1.2 billion in 1975 to $4 billion in 1985. Although more mature growth ratios are expected for plastic bottles over the next decade, the total market for plastics is expected to reach $11.7 billion by 1995 (FIND/SVP).

Versatility is the key to the dynamic growth of plastics. Plastics perform a greater variety of functions in food and beverage packaging than any other material. Plastics are also uniquely compatible with new processing and preservation techniques. Refrigerated products, including CAP/MAP products, aseptic cups, retorted single-serve soups and entrees, and dual-ovenable or microwave-only products all rely on plastics to provide lightweight, barrier protection.

Metal containers

Metal cans have maintained a strong position in the beer and soft drink markets, but have declined significantly in the food categories. Predictions call for this trend to continue because of competition from fresh, refrigerated, frozen and aseptic food packaging, which are handled by plastics and composites. However, some recent developments could alter these predictions a bit. Liquid nitrogen injection has finally made the aluminum food can feasible, and some meat products have already been introduced in aluminum cans from Reynolds Metals Co. Another innovation is a pull ring top developed for steel cans by Weirton Steel Corp. These developments, along with continued lightweighting and can processing cost reductions will continue to keep metal cans competitive.

> *"Packaging is inseparable from new market opportunities."*
>
> **R.M. Frisosky**
> **Packaging Manager**
> **General Foods**

Packaging with glass

Over the past few years, there has been a huge shake-out in the glass industry with mergers and acquisitions reducing the major players significantly. Six companies now manufacture over 80 percent of the glass containers used in the U.S. This has occurred because of a dramatic decline in glass usage between 1980 and 1985. Contrary to common belief, it was aluminum, not plastics, which hurt the glass industry. And, it was in one particular market – beer. However, the glass industry is on the rebound. Last year, glass shipments were up about five percent, reflecting increased sales in beer, soft drinks, wine coolers and juices in single-serve bottles.

New technologies in glass have focused on lightweighting. Using a method called "press and blow," glass is first mechanically pressed against the mold, before being blown into shape. The method, being employed in the U.S. by Owens-Illinois and American-National Can, distributes material more evenly throughout the container. This even distribution improves the strength of the bottle, while requiring less glass usage, making the container lighter. While predictions call for a continued decline in the use of glass, techniques such as lightweighting and prelabeling of bottles in the manufacturing plant, show that the glass industry is poised to respond quickly to any opportunities.

Paper, foil, composites

The combined market of paperboard, foil and composites should reach $19.2 billion by 1995 (FIND/SVP). This is due mainly to huge projected growth in frozen, refrigerated, microwave and aseptic packaging (see below). Laminated paperboard has been strong in the milk container market and is gaining increased use with juices and even wine. In the aseptic juice and juice drink market, laminated paperboard has dominance. Composite cans have become strong competitors in the powdered drink field and are looking to make inroads in the pet food and other moist product categories. Foil enjoys use mainly as lids and seals and as a barrier layer in conjunction with other materials. The battle for the frozen food segment is shaping up between various types of paperboard, plastics, and, to some extent, aluminum trays.

Microwaveable packaging

The microwave segment is probably the hottest area of growth in food packaging. The emphasis seems to be changing from dual-ovenable applications to microwave-only. The feeling among processors is that the population segments interested in convenience products are probably among the 70 percent of U.S. households which have a microwave oven. All four packaging areas – plastics, metals, glass and paperboard – are vying for a piece of this market.

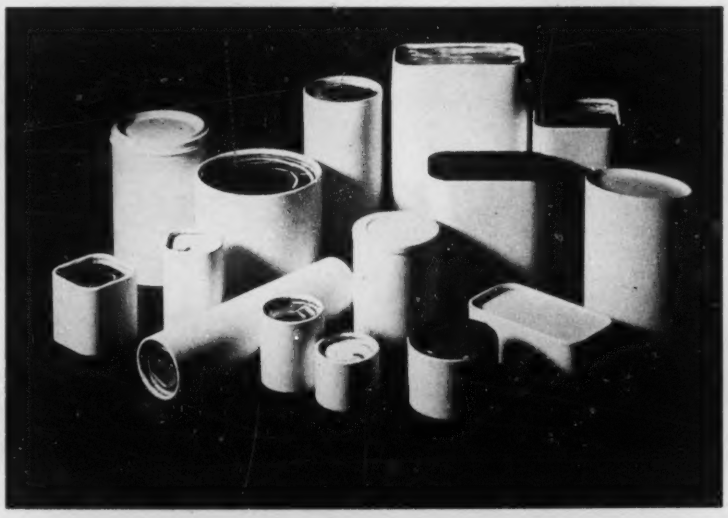
Plastic packages are transparent to microwaves and therefore do not interfere with the effect of the microwave energy on foods. In some instances, this makes for uneven product heating, but the use of metallized susceptors and shielding can improve the cooking results. Plastic packaging allows a product to be taken from the freezer to the microwave to the table in a short period of time, without changing containers. Glass and paperboard are similar to plastic in that they are also microwave transparent. Glass is finding microwave applications in pasta meals, sauces and cheese products. Paperboard is used for entrees, and vegetables, including single-serve applications. Aluminum trays are attempting a comeback in the microwave segment, making use of their non-microwave transparent properties. Instead of allowing the energy to pass through unhindered, aluminum makes use of its barrier properties to shape and focus the microwave energy, via the tray and an antenna-like array in a plastic dome, in order to make optimum use of the energy.

The advent of microwave cooking has caused a re-evaluation of traditional packaging parameters. In addition to the traditional roles of protecting the product and providing a graphic medium, the package

(Continued on page 74)

PORK SPARE RIBS
Chile
GOURMET
LASAGNA
GOURMET

The surge in households with microwave ovens has caused most traditionally conventional-oven-only packages to be re-designed for dual-ovenable or microwave-only applications. *(Photo courtesy of Westvaco.)*



Composite containers, combining paperboard supporting structures with plastic and/or foil laminations are economical replacements for traditional materials in some applications.

(Continued from page 71)

must also play a role in the final processing of the product. Besides having to know the physical properties of a wide range of packaging components, the package designer must also be able to determine how the product will react in a microwave oven in a particular form of packaging. Things like dielectric constants, thermal conductivity, density, frozen heat capacity, thawed heat capacity, and the actual geometry of both the food product and the package all have a bearing on product performance in the microwave oven.

Frozen & refrigerated foods

Freezer and refrigerated cases are receiving a lot of attention. Consumer demands for quality with convenience are finding answers in this category. But space is limited and competition is fierce. FIND/SVP predicts that frozen food shipments will go from $12.4 billion in 1985 to $29.6 billion in 1995, reflecting higher value-added products along with higher volumes. As a result, frozen food packages are being designed to optimize graphic area and appeal, in order to help the product stand out in the confusion of the freezer case.

Higher percentages of in-store decisions by consumers make product differentiation important throughout the marketplace. But nowhere is it as vital as in the freezer case. Crowded conditions and frosty doors make it difficult for a product to stand out. A good graphic presentation is needed on all four sides of the package as well as the lid. And the package configuration must be designed to stack well. Many companies are using computer graphics systems which provide a package designer with an almost infinite range of shapes and colors, interchangeable on command. This versatility in design is providing an array of package shapes and graphics in the marketplace.

Refrigerated foods either have a very short shelf life, or specialized packaging. Controlled or modified atmosphere packaging can increase refrigerated shelf life from a few days up to as much as a few weeks. This type of packaging depends heavily on plastics to act as a barrier or a control device for the particular atmosphere desired for the product. Controlled atmosphere packaging is used widely in Europe for meat, fish, pasta, prepared foods and baked goods, and is making inroads in the U.S., especially in fresh pasta. However, processors are hesitant to enter the CAP market unless they have a good regionalized distribution system. The key to CAP is tight control of the product (especially temperature control) from packaging through distribution. As experienced is gained with CAP products as well as other refrigerated products, larger companies will use acquisitions, gobbling-up firms with good distribution capabilities to handle this growing category.

> *"We try to provide the best package for the product, not just take a particular package. that will suffice."*
>
> **Curt Funke**
> **Manager of Package Engineering**
> **Kitchens of Sara Lee**

Shelf stable packaging

Metal and glass have traditionally dominated shelf stable food packaging. But in terms of plastics, shelf stable has the greatest potential. According to Dr. Druin, "The big growth that's being projected is in the area of shelf stable containers for retortable or aseptic applications." There are several barrier bottles on the shelves for hot fill applications, such as ketchup and sauces. Just coming onto the store shelves are soups and entrees. Campbell has microwaveable soups both retorted in plastic bowls and aseptically processed in plastic containers. Armour-Dial has its *Lunch Bucket* line of soups and meals. General Foods and Hor-

(Continued on page 76)

Plastics are rapidly changing the food packaging marketplace. Efficient coextrusion techniques along with research into blends and alloys promise to keep plastics dynamic. *(Photo courtesy of Eastman Chemical Products, Inc.)*

(Continued from page 74)

mel both have shelf stable dinners in retortable plastic containers. As aseptic technology progresses further, low acid, particulate type products will be finding their way onto store shelves. For example, Campbell has recently introduced creamy soups, which according to Druin, are the first application of aseptic, low acid particulate packaging in the United States.

Distribution packaging

A hidden function of packaging is that of providing protection and ease of handling during transportation and warehousing. According to Frisosky, "If the consumer sees a damaged package – e.g. a dented corner – he believes there is a possibility that it has been tampered with. So the need is there for protective distribution packaging." This means that packages must be designed, not only in an optimum configuration to enclose the product, but also to fit in a shipping case or tray, if necessary; and to fit on a pallet in a pattern allowing the best space utilization; and to stack high enough to ship economically; and to survive rough handling during shipment and in warehouses so that the product ends up on store shelves clean and in good condition.

Flexible packaging

As a whole, flexible packaging is continuing to make inroads against rigid packaging, due to cost savings and versatility. Besides material costs, savings can come in the form of reduced shipping costs for empty and filled containers and reduced storage space. Bag-in-box replacements for bottles and large cans, particularly in the food service area, are becoming more common. Marriages of flexible and rigid containers are increasing – e.g. composite can liners and labels, lidding for aseptic barrier containers and for CAP/MAP containers, as well as barrier/folding carton laminations.

Increased demands for convenience blend well with flexible packaging. Microwaveables, aseptics, hot fills and retortables all depend heavily on flexible packaging for their constructions. Improvements in coextrusion technology have lowered costs in relation to laminations. Barrier coextrusions make flexible packaging more versatile.

Who wants what?

Food packaging represents different things to different people. The government wants the package to provide protection from contamination and spoilage. The marketing department wants eye appeal and convenience. Advertising wants it to be a communications vehicle. The food technologist wants the package to maintain the stability of food components. The legal department wants the package to provide information on contents in conformity with regulations. Quality assurance wants the package to meet physical, chemical and microbiological requirements and to be in compliance with regulations. Then there is the consumer, who wants a price/value relationship that provides the following:

- Adequate shelf life;
- Convenient storage;
- Sturdiness;
- Attractiveness/informativeness;
- Dual-ovenability (if appropriate);
- Affordability;
- Protection from external contaminants;
- Ease of opening;
- Resealability;
- Flavor/aroma protection;
- Direct usage;
- Tamper evidence.

According to Lundquist, the consumer wants, "convenience *and* quality. The consumer doesn't care how convenient an item is, if it isn't any good."

It's up to the packaging department to come up with a combination of factors that will please everybody. "We try to provide the best package for the product," says Funke, "not just take a package that will suffice. We look at the product and determine how it will be used. Each product has its own characteristics and own marketplace which have to be taken into consideration."

Total demand for food packaging should reach almost $43 million by 1990, with the biggest gains coming in plastics and composites.

Food Packaging Demand
(Millions of Dollars)

	1975	1980	1985	1990	1995
Total Demand	14,188	22,762	29,224	42,990	63,150
Metal Cans	5,962	8,921	10,981	15,875	22,535
Glass Containers	2,654	4,079	4,300	5,305	7,700
Plastic Bottles	344	1,148	1,973	3,450	5,200
Other Plastic	902	1,330	2,046	3,880	6,485
Paper, Foil & Composites	4,052	6,805	9,226	13,275	19,235
Frozen Food Pkg.	174	246	347	530	790
Aseptic Packaging	–	–	29	145	300
Retort Pouches	–	8	12	30	100
Dual-Ovenable Pkg.	–	58	122	220	395
Dehydration, Freeze-Dry Pkg.	100	167	188	275	400
Irradiation Pkg.	–	–	–	5	10

Source: U.S. Dept. of Commerce, FIND/SVP

Deciding on the package

With so many options available, how are packaging decisions reached? The days of simply enclosing a product in a protective package and putting a label on it are long gone. How is the product to be marketed? What will the package cost? What level of protection is required? What length of shelf life is desired? Is the product to be prepared in the package? How will the packaging material affect the product? Can the package be run on existing equipment? These are a few of the questions to be answered before proceeding with a new package design.

With the myriad of options available, it would be easy to lose the forest, looking at the trees. The object is always to find the right package for the product, not to dabble in possibilities for their own sake. Package engineers and designers have to keep the basics in mind. Lundquist says, "If you look at it on a broad scope, even though the shape and the graphics may be different, the basic strategy is still the same, i.e., to protect the product and to maintain the natural quality of the product throughout the merchandising cycle. So I don't think the basic strategy is changing except to improve on it."

"We tend to be orchestrators," says Frisosky. "Operations is involved, engineering is involved, purchasing is involved, marketing is involved, vendors are involved. We're there to close the loop."

What is the process for creating a new package? At General Foods, most innovations are created as a team involving engineers, marketing and packaging technologists. "With a lot of products," says Frisosky, "it's difficult to separate the product from the package, e.g. aseptic beverages, shelf stable entrees, etc., in which case the food scientist and packaging technologist operate as part of the team."

Everything starts with a product at General Foods. Marketing will decide how they want to position that product in the marketplace which then dictates packaging, be it a bulk system, single serve system or multipack system. Objectives are set in terms of the package as well as the product.

Then GF goes through a very disciplined approach, involving creative thinking in terms of putting together various sketches and forms and shapes. "We may have an array of 25 different ways of packaging the product," says Frisosky, "and not be encumbered by the process. Broad screening brings the number down to four or five, at which point prototypes are built and the product is consumer-tested."

Plastic Bottles
(Millions of Dollars)

	1975	1980	1985	1990	1995
Total Packaging	14,188	22,762	29,224	42,990	63,150
% Plastic Bottles	2.4	5.1	6.8	8.0	8.2
Consumption (Current $)	344	1,148	1,973	3,450	5,200
Price Index (1985=100)	82.1	95.7	100.0	123.6	156.8
Consumption (Constant $)	419	1,200	1,973	2,791	3,316
Constant 1985 $ Per Capita	1.9	5.3	8.3	11.1	12.7

Source: FIND/SVP

While the percentage of plastic bottles used is starting to peak, they are still expected to maintain a healthy share of the total packaging market.

Sara Lee also uses the team approach, with marketing usually initiating a project. Funke says, "Our support is primarily to take the product that has been developed or is going to be developed. We are given the quality that is to be put in an individual packaging form and how many of those are going to be packed into a case. We then determine what type of packaging is required and make a determination on each material and how it interfaces with the food product. We're positioned within the corporation to help all the groups. We get involved with the production process, with marketing to make sure the package is printed properly and includes any required promotional materials, and with distribution to make sure it has the proper coding to go through the distribution chain."

(Continued on next page)

Plastic trays, cans and other forms of plastic packaging are enjoying a steady climb in market share, which is expected to continue.

Other Plastic Packaging
(Millions of Dollars)

	1975	1980	1985	1990	1995
Total Packaging	14,188	22,762	29,224	42,990	63,150
% Plastic Packaging	6.4	5.8	7.0	9.1	10.3
Consumption (Current $)	902	1,330	2,046	3,880	6,485
Price Index (1985=100)	61.0	79.0	100.0	128.0	172.9
Consumption (Constant $)	1,479	1,684	2,046	3,031	3,751
Constant 1985 $ Per Capita	6.9	7.4	8.6	12.1	14.4

Source: FIND/SVP

NEW! CRISPY!
with Qwik Crisp Board
Ore Ida
MICROWAVE
TATER TOTS

Microwave packaging is a specialized art which includes the use of susceptors for browning. *(Photo courtesy of ICI Americas.)*

(Continued from previous page)

Campbell Soup has 53 business units operating worldwide. Typically, these units provide Packaging with a "needs list." Dr. Druin says, "They tell us what new products are under development. If the product is totally new, they'll provide us with the parameters – e.g. how it's being processed and how they would like the consumer to be able to handle it. We'll make a decision on the appropriate container. We'll then get involved with the product development people who do food formulation and with engineering and operations. (In many cases, a new container would mandate new fillers, sealers, case packers, etc.) We try to assess the container requirements as a team in order to achieve the kind of package needed. It then becomes a business decision as to whether the costs involved justify the market opportunity."

At Armour, projects may come from anywhere. And while marketing sets the initial objectives, "we're teamworkers," says Lundquist. "Different people with different abilities contribute different information. We contribute from the standpoint of package development, product protection and in some cases, package design. We also depend on the engineering people to assist us in design and plant layout and industrial engineers on the effect of cost."

Keeping informed

The main way packaging engineers keep informed about what types of packaging are available, is to keep in touch with suppliers. Lundquist says, "The most important resource we have is that our packaging suppliers are essentially a part of our packaging team. When we do a major project, we carefully select suppliers who will participate in relation to their capability."

Funke agrees, "What we do is stay in constant contact with suppliers that are involved with key developments in the industry that serves us. We have an open door policy in the packaging engineering department. If we hear of something applicable to our work, we'll contact the supplier."

Campbell Soup has taken an active approach to keeping informed. They first try to identify the hot spots within the U.S. in terms of vendors and material suppliers. And, since most of the new technological activity is happening in plastics, Campbell has invested $4 million in a Plastics Center, a prototype center for making experimental plastic containers and brought on 15 people with close to 100 years combined experience in plastics technology. Dr. Druin says, "By investing in our Plastics Center, we can evaluate and understand the nature of the range of technologies under development. We can understand how to focus on those companies we should be working together with. Our philosophy is getting into joint developments."

Only the beginning . . .

As awesome and complex as the proliferation of packaging options has been, the fact of the matter is, we are not in the midst of the explosion – we're only at the beginning. According to Dr. Druin, "The excitement in terms of plastics technology is that we're in the very formative stages. While coextrusion is a means to the ends of what is required today, plastic technologists are going to provide us with monolithic plastics able to perform like multilayer barrier structures. With the use of blends and alloys we'll be able to tailor mix and match some of these materials to build in low oxygen permeation and sensitivity to moisture, etc. That will probably expand the market more rapidly because it will be less expensive than coextrusion."

"The name of the game is profit," says Lundquist. "If you see a new packaging opportunity, then the item is analyzed to determine its relative value." Then the final decision can be reduced to a matter of marketing and economics.

Metals, glass, paperboard and composites are all reacting to innovations in plastic materials with technological advances of their own. The net result is that opportunities to provide excellence in product/packaging systems are becoming continually more abundant.

CHILTON'S

OCTOBER 1987

FOOD ENGINEERING

SINCE 1928, THE SOURCE ON PROCESSING, PACKAGING, AND PRODUCT DEVELOPMENT

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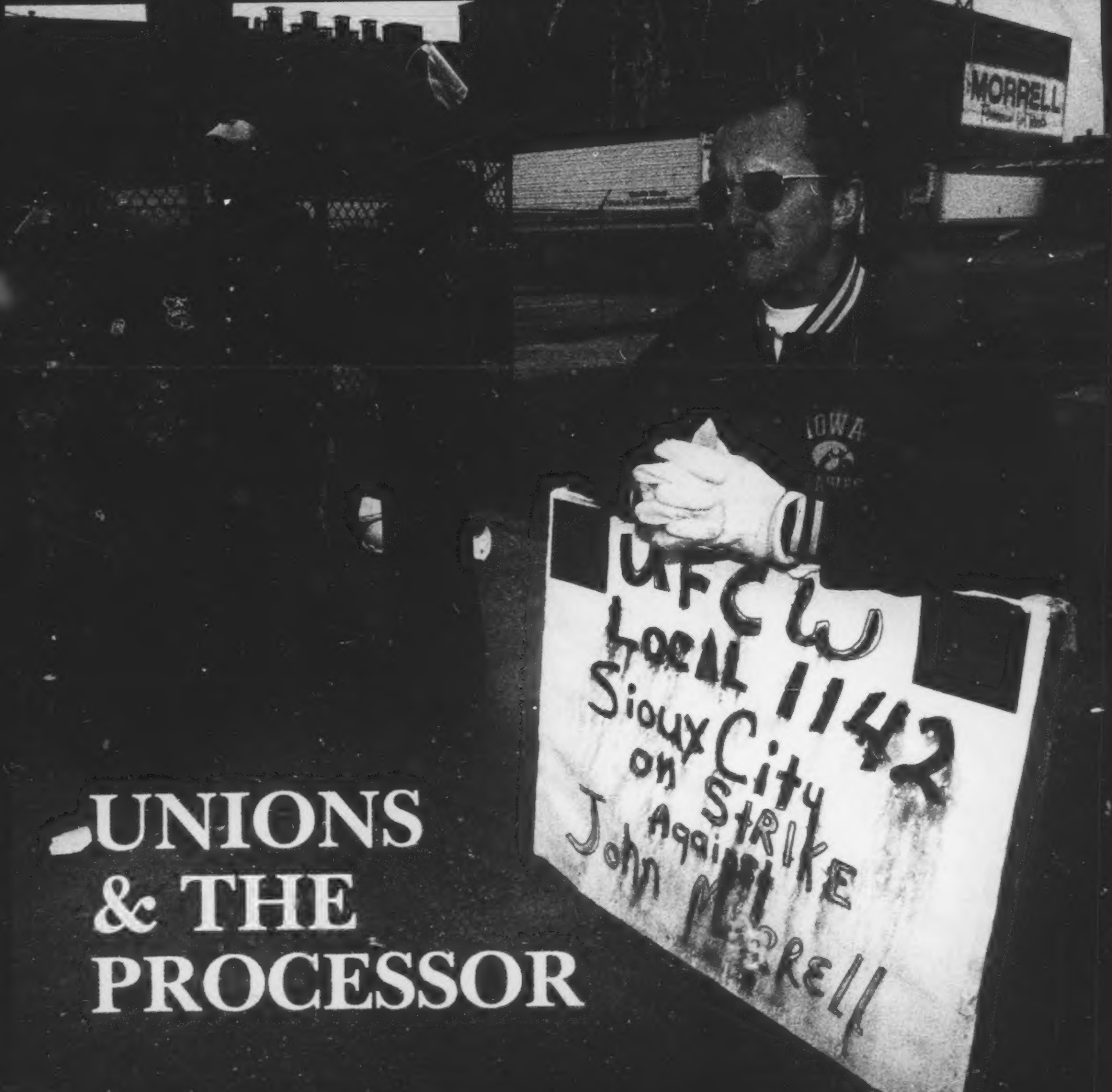
MORRELL
IOWA
UFCW
LOCAL 1142
Sioux City
on STRIKE
against
John Morrell

UNIONS & THE PROCESSOR

FOOD ENGINEERING

OCAL 114
OUX City
on STRIKE
Against
MORRELL

COVER STORY

Food companies have increased pressure to do a better job of getting return on investments. Reducing labor costs is one way. But unions are fighting back. Cover photo by Dean Curtis.

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News

15 Industry Report

This month's Report talks about the shortage of qualified college graduates to fill food and agricultural positions; the guidelines proposed by the FDA giving the food industry greater freedoms in the kinds of health-related messages that can be placed on labels; the Department of Agriculture proposal to limit ingredients that may be listed as flavorings to spices and oils; and former FDA Director Sandy Miller's comments on challenges facing food regulators in the years to come.

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HIGH-PROTEIN BAR: PAGE 43

Food Packaging

50 Two-Part Entree

Retortable, microwaveable plastic tray forms lid, contains sauce for noodles in a paperboard bowl.

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This technique deposits the alloy directly onto the surface of the film.

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60 Flexible Packaging

A prototype reuseable flexible packaging system developed for carbonated beverages keeps the pressure on.

62 Customized CAP

Selected barrier properties control gas diffusion rates for packaging fresh meat and bakery products.

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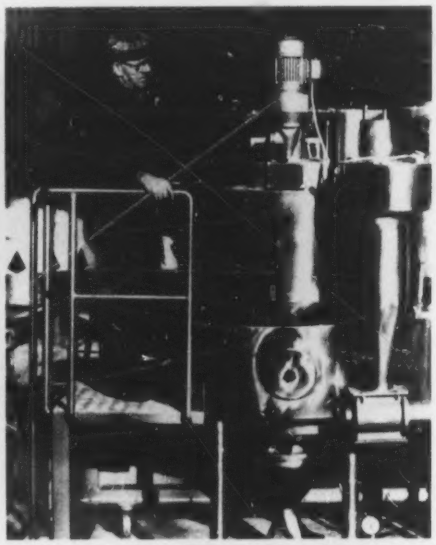

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BRIGHT PROMISE, SLOW GROWTH FOR ENZYMES

Technological breakthroughs are dramatic, new and improved enzymes are introduced at a brisk pace – yet the industry plods ahead at a slow rate of growth.

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DEALING WITH UNIONS...

Has the adversarial role between management and labor gone too far in the food industry? Examining some of the recent conflicts can offer insights.

ANN E. PRZYBYLA
Technical Editor

American food companies have been feeling increased pressure to do a better job of getting return on investments. Reducing labor costs is one way. But unions have been fighting back.

At press time, for instance, strikes remained unsettled at John Morrell's Sioux City, IA and Sioux Falls, SD plants. In fact, the meatpacking industry has been plagued with numerous strikes over the past several years and with negative publicity concerning working conditions.

In March of this year, one of the most violent strikes in this country's recent frozen food history ended only when Watsonville Frozen Food Company went bankrupt.

And even though the Teamsters ended a three-week strike against Sara Lee Corp.'s Deefield, MI plant last June, they were not happy. They only backed off because they were in a difficult bargaining position when the Bakery, Confectionery and Tobacco Workers settled and went back to work despite Teamster picket lines.

At the same time that the Teamsters were settling with Sara Lee, the Department of Labor was looking for ways to bring U.S. labor and management together in some reasonable way. In June they issued a first interim report on the matter – *U.S. Labor Law and the Future of Labor-Management Cooperation*.

The purpose of the report was, "to increase awareness of labor-management cooperation; to stimulate debate, discussion and research into potential impediments to cooperation; and to encourage scholars, practitioners and other experts in the field to take a fresh look at our legal structure, with a view to examining its effect on labor-management cooperation."

The need is obviously there since, of the hundreds of responses the Department of Labor received to the report, 83 percent were affirmative and supported the project.

Professor Richard N. Block, Michigan State University School of Labor and Industrial Relations, said, "The interest of the Department in encouraging cooperative labor-management relations is an important step in improving the competitiveness of the United States economy and in effectuating adjustments to the enormous structural economic changes that have occurred in the last decade..."

Bitter strike lasts 18 months

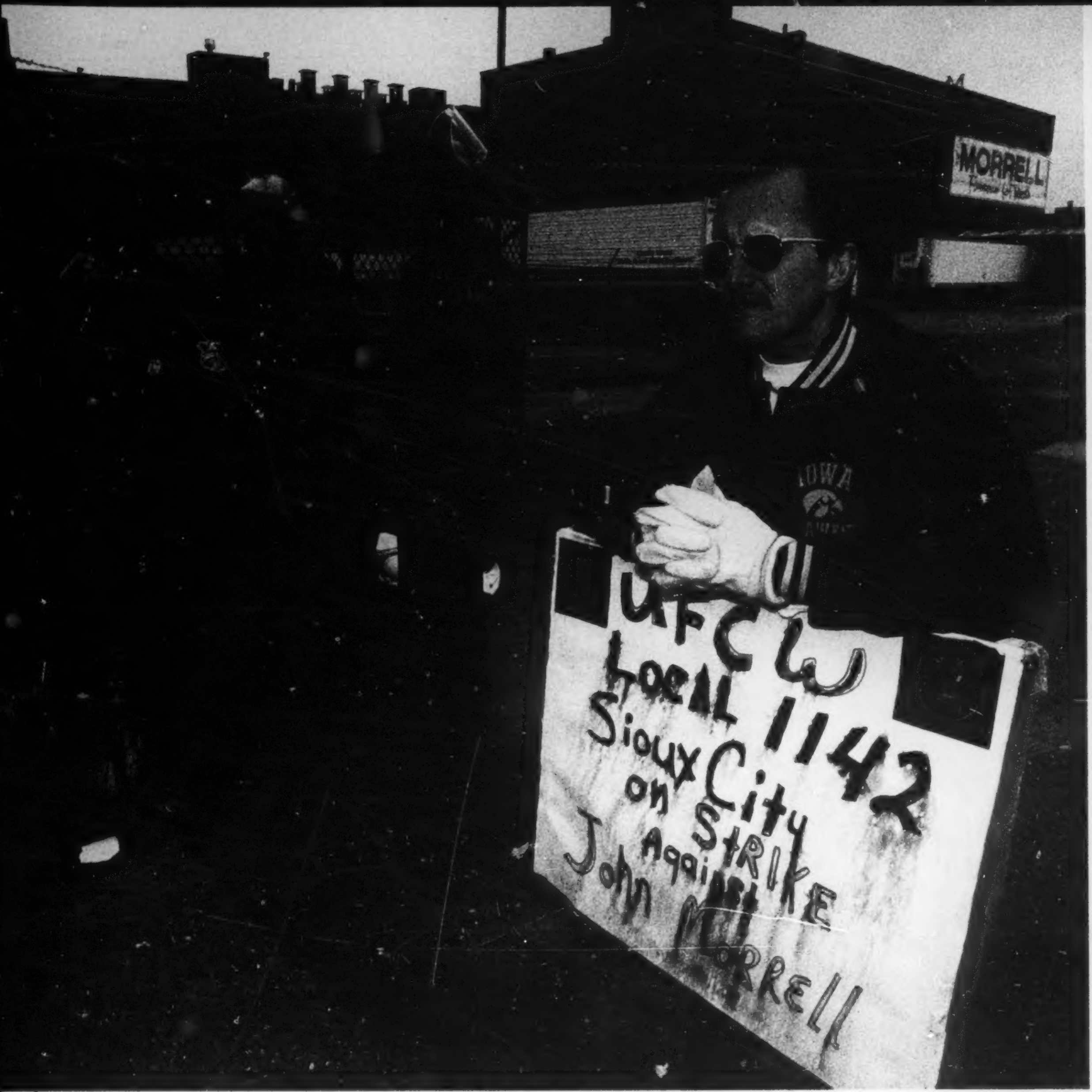
Professor Block's comments may sound a bit abstract, so let's take a case in point – the California frozen food industry. After one bitter 18-month strike, industry and labor are now working together for solutions to increased competition from abroad.

Prior to 1985, most California frozen food processors negotiated for a standard contract with the Teamsters through the California State Frozen Foods Association. In 1985 most plants broke away from the association, which left each processor to negotiate its own contract with the union.

Watsonville Canning & Frozen Food Company had economic problems; so the union agreed to a contract with lower wages than most of the other frozen food companies obtained during 1982 contract discussions.

So far, so good. But, according to Leon Ellis, president of Teamster Local 912, the problems began when Watsonville Canning started to advertise that it could provide product at a lower cost because it paid its workers a lower wage. This was compounded, Ellis claims, by the fact that Watsonville's economic problems were caused by mismanagement – both overproduction and corruption within management. (In fact, two officers in the company were convicted of embezzlement.)

In the 1985 contract discussions, Local 912 accepted a 17 percent pay and benefit cut in negotiating three-year contracts with frozen food processors. But Watsonville, along with another firm, Richard A. Shaw Inc., demanded cuts up to 30 percent. At this point, in September 1985, Local 912 went on strike against both Watsonville and Shaw. Both companies brought in strikebreakers and continued operating.



A strike at the John Morrell meat packing plant in Sioux Falls, SD continues as management and labor dispute wages and other issues. Photographer: Dean Curtis.

After five months, Shaw and the union settled on the same pay cuts and benefits as other processors and workers had agreed to. In addition, a profit sharing plan was set up for workers.

The strike at Watsonville continued and became a bitter confrontation. Stones were thrown at buses bringing in strike breakers from outside the town of Watsonville and local police used clubs and tear gas in dispersing and arresting strikers and their supporters. No residents of Watsonville crossed the picket line. Part of the reason for this, according to Ellis, was local support for the strikers was so strong that any strikebreakers from Watsonville would have been killed.

The strike also received broad Teamster support. National and regional Teamster officials campaigned to discourage growers, financial institutions, and others from dealing with Watsonville Canning. According to one source, the Teamsters put $45 million into supporting the Watsonville strike.

Strike touted as a success

The strike was hailed as a success by labor leaders. One sign of this is that, after 10 months, and during government-supervised balloting that included the strikers' replacements, Local 912 was elected to continue representing the workers. Over 900 of the strikers—most of whom were Hispanic women, many single parents—cast ballots, including some who drove 15 hours from Mexico.

The strike still continued for eight months after the election, at which time the bank

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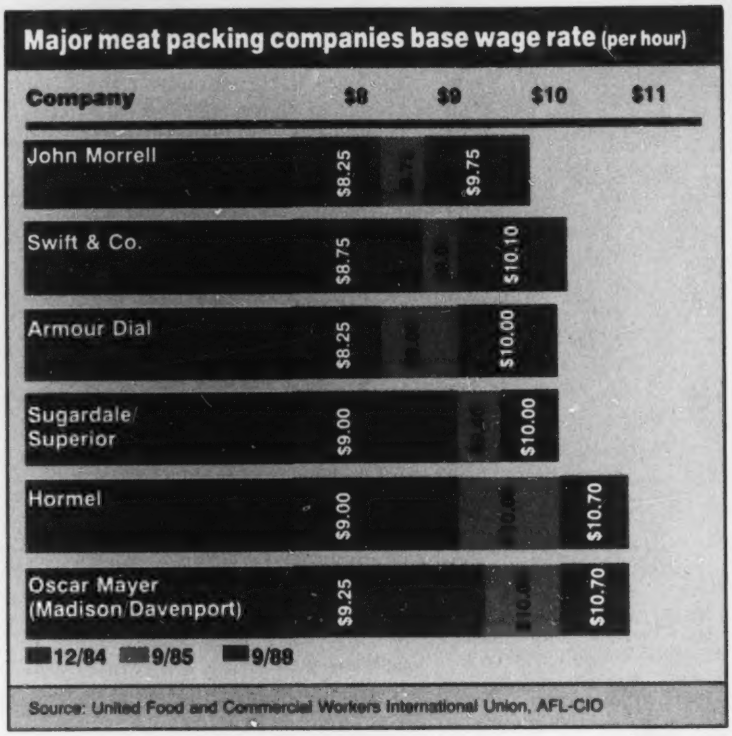
Major meat packing companies base wage rate (per hour)

Source: United Food and Commercial Workers International Union, AFL-CIO

(Continued from page 75)

decided to foreclose on its loans and seize the assets of the company. At this point, in early 1986, Watsonville Canning owed about $7 million to the growers and more than $18 million to Wells Fargo Bank.

The growers came to an agreement with the bank to buy the plant and equipment, and formed Norcal Frozen Foods, Inc. The new company quickly settled with the union. Salaries that had ranged from $6.66 to $12.56 an hour were trimmed to $5.85 to $11.56 an hour, but a profit sharing plan was instituted. A two-tier system was also set up where employees hired after a certain date are paid less than those hired earlier.

One note: The two-tier system is becoming more prevalent as industry tries to reduce costs, but it ends up being a trade-off for both sides—especially labor. Since the two-tier wage system is being implemented in the food industry with current contracts, it's too early to tell the long-term effects. But it seems likely the unions will find dissatisfaction among their members as an increasing number are on the lower pay scale. This will most likely influence future contract negotiations. And the effect will become apparent quicker where turnover is higher.

Unions more sensitive?

Accepting wage cuts at Watsonville was not easy, but it was at least at parity with other California contracts. Leon Ellis is especially pleased with the profit sharing plan, because this requires the processors to open their books and allows the union to get an accurate account of the company's finances.

Still, why did the California workers accept pay cuts at all? One answer, in general, is perhaps in the Department of Labor's report: "Further, we believe there is evidence that unions are showing a greater sensitivity to the fact that the well-being of the workers they represent depends upon the financial health of the enterprise."

On a more pragmatic basis, the California Teamsters went to Mexico to look at the competition; and when they came back they had, according to Ellis, made a very simple decision. While the union wanted its "fair share," at the same time, "we don't want to kill the goose that laid the golden egg."

Some background: California is losing market share of frozen vegetables to non-union Texan plants—and plants in Mexico where labor costs can be as low as $3 to $5 a day. In the last eight years, at least three new frozen food processing plants were built in Texas while a number of California processing plants closed. Currently Norcal runs at only 70 percent of capacity.

Late last year, The University of California Cooperative Extension published a study of the frozen vegetable industry in Mexico. It pointed out that in 1985, U.S. imports from all sources equaled 22 percent of the frozen broccoli pack and 39 percent of the frozen cauliflower pack. Of that, Mexico provided 82 percent of the broccoli and 89 percent of the cauliflower.

The report went on to point out that "the rapid decline in the peso's value during 1986 was accompanied by a sharp increase in the annual rate of frozen vegetable imports. The exchange rate is likely to remain low for economic and political reasons and may stimulate a significant expansion of U.S. imports in 1987."

Currently both management and labor at Watsonville and throughout the California frozen food industry are happy with their agreements and are even working together to overcome obstacles facing the frozen food industry.

For example, Richard A. Shaw began a program—T.H.A.N.K.S., Inc.—which has the mission to educate American consumers about farm products produced, packed, and processed in the U.S. and to provide identification of these as such in the marketplace. They use a seal showing a tractor and the words, *100% U.S. Grown T.H.A.N.K.S.*

(Continued on next page)

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Revamping an industry

In another processing area – meat packing – where labor costs are especially high (as much as 50 percent of operating costs), a revamping of the industry beginning in the 1970s – along with changing techniques in production – have caused labor problems which continue today.

The meat packing industry has been the target of a number of strikes during the past several years. (In fact, from 1980 to 1985 there were 158 strikes in this industry.)

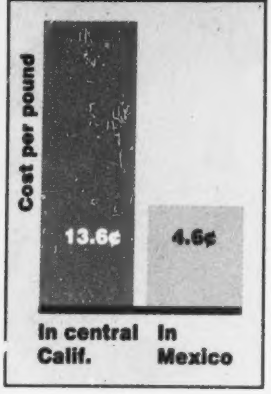
A strike at John Morrell is in progress as of this writing. The company has offered a four-year contract to its Sioux City, IA workers with a $1.00 per hour wage cut. But the workers had accepted a $3.22 per hour cut in 1984 and want to regain some of that.

Lewie G. Anderson, international vice president and director, packinghouse division, the United Food & Commercial Workers (UFCW), blames the turmoil on three main issues. First, the meat packing industry is becoming highly concentrated, with fewer and bigger operators. Second, old-time packers who dominated the industry from the turn of the century into the 1970s are leaving the industry. And third, the union's master agreements with the meat packing industry which were in place from 1941 to the mid-1970s are no longer valid.

During the mid-1960s and early 1970s a number of conglomerates took over many of the major meat packers. These include: Greyhound/Armour & Co.; LTV/Wilson Foods; United Brands/John Morrell; General Host/Cudahy Foods; and Swift & Co. evolved into a large holding company known as Esmark. The first move by the conglomerates after acquiring a packing company, according to the UFCW, was to sell off certain of the packer's assets. For example, between 1970 and 1980, Greyhound sold off $237 million worth of Armour's assets. Between 1965 and 1983, conglomerates closed or sold approximately 130 meat packing plants owned by the Big Six master packers.

And there were other problems. Greyhound, for example, voided the union master contract days before selling its Armour packing plants to ConAgra, allowing ConAgra to

Cost of producing one pound of frozen broccoli



Above: A University of California Cooperative Extension study on the Mexican frozen vegetable industry relates the cost of producing frozen broccoli in Mexico versus in central California. *Right:* Wage patterns within the food industry vary according to geographical location, state of the particular segment of the food industry; and type of contract negotiated. Wage discrepancies between different companies or plants within the same type of processing area are contributing to labor problems.

Sampling of current food industry/labor contracts

Company	Plant(s) location	Union
Keebler Co. Elmhurst, IL	Atlanta & Macon, GA; Grand Rapids, MI; Denver, CO; Cincinnati, OH; and Van Nuys, CA	Bakery, Confectionery and Tobacco Workers
Sara Lee Corp. Deerfield, IL	Deerfield, MI	Bakery, Confectionery and Tobacco Workers and International Brotherhood of Teamsters
NorCal Frozen Foods, Inc. Watsonville, CA	Watsonville, CA	International Brotherhood of Teamsters
Mexican-based frozen food plants – U.S. owned	Mexico	Nonunion
Tri Valley Growers Modesto, CA	All plants – various CA locations	International Brotherhood of Teamsters
Sun Diamond Growers Stockton, CA	Stockton, CA (walnut plant)	International Brotherhood of Teamsters
Geo. A. Hormel Austin, MN	Austin, MN	United Food and Commercial Workers
IBP, inc. Dakota City, NE	Dakota City, NE	United Food and Commercial Workers

reopen most of the plants with a non-union workforce, points out Anderson. (Workers at ConAgra/Armour's Mason City, IA meat packing plant voted on February 26 of this year for representation by the UFCW union. The UFCW called this organizing win its largest at a major packing house since 1979.)

Last month, ConAgra announced a tentative agreement to settle a National Labor Relations Board (NLRB) case concerning this incident. The charges were filed by the NLRB on behalf of some former Greyhound employees who were not hired by ConAgra. Under the terms of the agreement, which does not establish any violation of the National Labor Relations Act, ConAgra will pay $4.95 million plus interest and taxes, or a total of $6.6 million, to settle the case and avoid further expense and disruption of employees. Earlier ConAgra initiated a voluntary program of offering jobs to former Greyhound/Armour employees which will now be completed under the settlement.

The largest meatpacker today by annual sales is a relatively new company – IBP, Inc. Founded in Denison, IA in 1960, its 1986 sales were $6.8 billion. IBP is credited with developing the boxed beef method of processing, which reduces shipping costs by eliminating shipping of bone and extra fat.

Only three of IBP's 14 operational plants are unionized. The company's Dakota City, NE beef processing plant is a UFCW plant, and the Teamsters organized its Amarillo, TX, and Pasco, WA, plants.

This has made IBP's non-union plants the target of an organizing program led by the UFCW. By making IBP the first target, UFCW president William H. Wynn said that he was "putting the toughest first." Each of the five contract discussions between UFCW and IBP's Dakota City plant during the past 17 years has resulted in a strike. The most recent strike began in March of this year when union members voted unanimously to reject another round of wage cuts. A settlement was reached in July which maintained the wage levels previously in effect for employees hired prior to December 14, 1986 and provides them with at least a 15 cents an hour increase late in the third year of the

(Continued on page 81)

Current Contract Wages	Current contract ends	Strike prior to current contract
$1,000 lump sum payment, 1st year – 10.5¢ increase for maintenance workers; 2nd year – 60¢ increase for maintenance and 50¢ increase for other workers. After increase: $11.97/hr for general help, $12.60 for mixers and machine operators; and $14.55 for electricians.	Oct. 31, 1988	--
Two year wage freeze of $10.43 to $11.50/hr. New hires $6.75/hr, after one year $7.00/hr.	June 30, 1989	yes
Cut from $6.66 - $12.56 to $5.85 - $11.56. Profit sharing plan instituted.	March, 1990 with wage discussion next year	yes
$3 to $5/day.	----	---
$8.02 to $12.98/hr. (Company asked for wage freeze and 2-tier wage system last June, workers turned it down.)	June 30, 1988	no
Average reduction of 35 percent in wages to $4.25 to $8.00/hr.	June 30, 1988	no
70¢ increase to strikers to $10.70/hr. Replacement workers from $8 to 9/hr to $10.70/hr.	Aug. 1990	yes
Wage freeze. Two tier: $7.90/hr for processing and $8.20/hr for slaughter; new hires 50 to 60¢/hr less.	1990	yes

(Continued from page 79)

contract. It also establishes a lower wage tier for new employees.

In announcing the end of the strike, IBP stated, "We are pleased this unfortunate labor dispute has ended and that our striking employees will be returning to work shortly. Everyone loses when there is labor strife and it is IBP management's sincere hope that there will be a new era of cooperation and labor peace in the Dakota City operation."

The company and union agreed to an optional four-year extension of the contract, which contains wage improvements and continued company retirement contributions. If mutually agreed to at the end of the first four years of the contract, the optional provision would extend the contract until 1995 and trigger the additional improvements.

Meat labor holds firm

While union membership among meat packing workers has dropped since the 1950s, support is growing. Processors need to realize that while, as mentioned earlier, unions may be showing greater sensitivity to the financial health of the processor, there is a limit to what they will give up before fighting back.

The UFCW contends that offering concessions to employers will not save plants. The union points out a number of plants (i.e., John Morrell, Estherville, IA and Memphis, TN; Rath Packing, Waterloo and Columbus Junction, IA; Wilson Foods, Monmouth, IL; and Armour, Nampa, ID) where concessions were granted and the plants still closed. The union also maintains that the wave of concessions in meat packing that took place from 1979 through 1982 was initiated not only by packers in financial trouble but by profitable packers as well. This is why, during 1985/86, the UFCW began the process of recovering lost wages from previous years. The union not only wants higher wages but also the establishment of a firm national wage standard.

The food processing industry has moved further away from negotiating master contracts, which has resulted in a discrepancy of wages between processors—even in similar geographical areas. And these discrepancies are behind many of the labor-management problems within the industry.

"Current wages in the meat packing industry don't follow any pattern, and therefore companies are not competing on their ability to produce efficiently," Lewie Anderson explained to *FE*. "This is very destructive to the industry."

The only overall decrease in average hourly wages for meat packing plant workers occurred in 1983 when wages went to $7.42 from $7.60 in 1982, according to the Bureau of Labor Statistics. This was during a period when the meat packing industry was hit by bankruptcies and plant closings.

It was at this time that Hormel, like others, asked its employees to accept wage cuts so that the company could remain competitive. Workers at eight of Hormel's plants agreed; the Austin, MN plant (Local P-9) employees did not. National leaders of the UFCW condemned Local P-9's action in breaking ranks with the other locals.

By August 1985, 1,400 employees struck Hormel's Austin plant. After a long strike which involved calling in the National Guard, Hormel and the UFCW settled for wage rate.

Conflict always present

"We emphasize that cooperation [between labor and management] in areas of mutual interest does not remove all conflict; indeed, conflict can be creative. The question is whether the overall relationship is driven by adversarial or cooperative considerations," states the U.S. Dept. of Labor's report.

Creative solutions may be needed to negotiate the next contract at Sun Diamond Growers' Stockton, CA walnut plant. While their current contract doesn't expire until June 30, 1988, talks have already begun with Cannery Workers Local 601 (part of the Teamsters) representing the employees.

Local 601's current contract with Sun Diamond included an average 35 percent reduction in wages, with a one-time bonus of $1,000 to $10,000 based on the number of years employees had worked for the company. The wage reductions varied from 15 percent for mechanics and electricians to 45 percent for line workers.

In explaining the need for a wage reduction, Vince Brown of Diamond Walnut said

(Continued on page 84)

Many of the contracts for California canneries are due for renewal on June 30, 1988. With seasonal products—such as tomatoes—a strike can be especially devastating. Photographer: Mark Przybyla.

Average hourly wages for food production workers

Type of food production	SCI code	Preliminary July 1987	1986	1985	1984
Preserved fruits & vegetables	203	$8.49	$8.03	$7.81	$7.64
Canned specialties	2032	$10.28	$9.96	$9.58	$9.12
Canned fruits & vegetables	2033	$8.56	$7.88	$7.75	$7.72
Frozen fruits & vegetables	2037	$7.73	$7.37	$7.25	$7.14
All meat	201	$7.43	$7.31	$7.23	$7.24
Meat packing plants	2011	$8.29	$8.24	$8.10	$8.17
Sausage & other prepared meats	2013	$8.94	$8.75	$8.74	$8.89
Poultry & dressing	2016	$6.14	$5.93	$5.75	$5.54
Bakery	205	$10.00	$9.88	$9.69	$9.37
Breads & cakes	2051	$9.95	$9.80	$9.68	$9.39
Cookies & crackers	2052	$10.13	$10.07	$9.70	$9.34
Beverages	208	$11.92	$11.71	$11.38	$10.90
Malt beverages	2082	$16.62	$16.26	$15.68	$15.10
Bottled & canned	2086	$9.57	$9.12	$8.69	$8.26

Source: Employment & Earnings, U.S. Department of Labor, Bureau of Labor Statistics.

(Continued from page 81)

that the walnut industry was and is having severe economic problems. There is erosion of marketing capability in Europe and other international markets. Also, he pointed out that Diamond's wages were out of line with other walnut packers.

The company also made concessions. Management was reduced during that time from 94 to 65 people. And Diamond opened its books to the union to substantiate its claim of economic hardship.

Still, when the union settled for the current contract without a strike, many union members were upset. Shortly thereafter Local 601 voted in its first new leader in approximately 20 years. Lucio Reyes became secretary-treasurer of the local.

Concerning the Diamond Walnut contract Reyes said, "The old union leader didn't explain to people their rights – the more you educate the members, the better."

The union expects to regain its losses in the next contract, but the company feels its wages are still the highest in the industry and doesn't want to make the same mistake by artificially inflating wages. "This may be a tougher negotiation than the last one," Brown said. "There are now 75 walnut processors in California compared to 54 in 1985 – with more people in the business there is more opportunity to undercut prices." Diamond wants to keep the wages where they are. "Although we'll hear demands for excessive wages, we won't be maneuvered. Why flirt with disaster again?" stated Brown. "There may be creative ways we can come to a resolution," he added.

Cannery contracts end next year

Cannery Workers Local 601 also has a number of other cannery contracts coming up for renewal June 30, 1988 – at the beginning of canning season. With seasonal products, a strike can be especially devastating. The last strike against California's canneries occurred in 1976. After that strike, both sides agreed that a mediator would be hired if necessary to avoid future strikes.

During the 1970s all the major canneries in California belonged to the California Processors Incorporated (CPI), and the local Teamsters who bargained with the canneries belonged to the Cannery Council. The CPI would negotiate a master contract with the Cannery Council. However in 1985, Tri/Valley Growers (TVG), Modesto, CA, separated from CPI, even though it still settled for the same wage agreement as CPI.

Late last year TVG approached the Cannery Council and asked the union to consider reopening the existing contract before its expiration date on June 30, 1988. The reason for the request was that a number of smaller plants – but with a total combined output greater than that of TVG's – were paying lower wages and TVG was losing market share. Hence, jobs were being lost.

In fact, during 1985-86, Tri/Valley closed three facilities – two fruit and one tomato – due to decreased sales volume. Ed Miller, senior VP, TVG human resources, did point out that the company is not losing money, but lost sales still means lost jobs.

The company's wage proposal, first made to the union last October, asked for two changes in the current labor agreement. "First, TVG proposed to freeze the July 1 pay increases for hourly employees. Second, it recommended that new employees hired after July be paid at lower, more competitive rates – the same rates paid by Sierra Fruit." (Sierra Fruit, Sacramento, CA, is paying new hires $4.75 per hour.)

The Cannery Council's executive board decided not to reopen the existing agreement with Tri/Valley, an agreement which covers 9,000 Tri/Valley workers at 13 plants. The union explained to its members that if Tri/Valley got a lower rate, then the other big canners will demand the same, and then many smaller canneries will probably have to lower their wages even further just to survive. This would result in no real advantage for Tri/Valley, but it would create a down-

(Continued on page 86)

JOHN MORRELL & CO.

Strikes can lead to acts of violence – the car shown above was turned on its side by strikers at the John Morrell Sioux Falls, SD plant during a strike that was in progress at this writing. Photographer: Dean Curtis.

(Continued from page 84)

ward wage spiral throughout the industry.

However, Lucio Reyes contends that "even if we give concessions, there is no guarantee the company won't close a plant."

A newsletter article from Local 601 to its members (about TVG's proposal) ended by stating, "We have given up a lot in the last six years. Once we decide that we have taken enough cuts, and that we are willing to stick together to defend ourselves, nothing can stop us!"

Recently, a major change in top TVG management was made. The main purpose of the changes was "to enhance the relationship between Tri/Valley's members and its valued employees and to improve the communications and understanding of our common goals by both groups."

Board Chairman Jim Saras assumed the position of Chief Executive Officer in addition to his Board responsibilities. Former CEO Travis Mullinex remained as President and assumed the additional role of Chief Operating Officer.

"Somehow, we've got to make every employee feel they are part of Tri/Valley and that they are important," Saras stated. And he named better employee communications as the number one priority for Tri/Valley in 1987/88 – especially at the plant level.

Get employees involved

Involving employees more in decisions affecting the company has been suggested as a method to improve management/labor relations. According to the U.S. Dept. of Labor's report, "Many in the business community, both unionized and non-union, have shown interest in work force participation and employee involvement as a means of increasing competitiveness and internal efficiency."

A number of food companies have found success by incorporating this idea. Campbell Soup Co., Camden, NJ, has set up more than 500 Quality Circles in its plants – both union and non-union.

David Hackney, of Campbell Soup Company's public relations department, explained that people become frustrated when they feel they have no control over their situation. And while not all suggestions are acted upon, Quality Circles give workers a chance to be heard.

In a U.S. Department of Labor follow-up report to the labor/management cooperation document, a section is devoted to responding to comments. In this section, it states: "We *do* start from the premise that labor/management cooperation is desirable, a view we hope is shared by most knowledgeable persons in the labor relations community. Labor-management cooperation has, in case after case, demonstrated its effectiveness in helping American industry meet the challenges of a changing economy, including intensified international competition; cooperation has demonstrably increased productivity and quality (of products and of worklife). Moreover, it serves human values by giving workers a greater sense of self-worth and pride, and a way to use their talents more effectively. We believe strongly that labor-management cooperation – whether called participative management, employee involvement, union-management committees, QWL or whatever – is essential to the future success of American industry."

Each segment of the food industry needs to find what solutions work best in their situation, and sometimes this may involve creativity. But, when the workers are represented by a union, it is important for the processor to recognize it as the legitimate representative of its members; and remember that while a union may be willing to sacrifice if necessary to save jobs, it can only be expected to do so to a point.

Another important thing to remember is: Be open with your employees – if the company is experiencing financial difficulties, let the workers know from the outset. But expect them to want their fair share when the company returns to profitability. And last, but certainly not least, employees need to feel an important and integral part of the company's success.

As Nick Fidandis, chairman of the Joint Labor/Management Committee of Retail Food Industry and formerly Director of Mediation Service, U.S. Dept. of Labor for 17 years, points out, "A strike is a no-win situation on both sides with wasted energy and misdirection of resources."

PACKAGING BUYERS SURVEY

Reading the charts: The numbers given indicate the percentages of respondents who checked off an individual category. For example, in the chart below, 66.7 percent of our respondents who work in firms with less than 100 employees, said that Corporate Management has major influence on Package Design decisions. On the opposite page, 6.5 percent of respondents involved in the manufacture of Meat Products, purchased domestically-manufactured Aseptic Packaging Equipment. The charts are the result of a survey of 367 managers in the food industry.

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Convenience features

"Convenience with quality" seems to be the rallying cry of processors in response to consumer demands. As shown in the accompanying chart, many processors are considering or have recently activated programs dedicated to improving these features. Almost 50 percent of our respondents are introducing new shelf-stable products (ed. note: As this category includes everything from canned soup to bottled juice to shelf-stable, plastic-packaged entrees, it was expected that this category would draw the greatest response, because shelf-stable products are among the most convenient to use.)

Another 33.8 percent are introducing easy-pour or easy-open features. Wish list responses in this area included:

- "A truly resealable pouch. One that the end user can reseal three or four times without product degradation, yet is economical."
- "A lid material that would reliably seal yet is easily peelable."

The penetration of microwave ovens into American households has reached 70 percent, opening up a whole new market. Almost 32 percent of respondents said they were converting products to dual-ovenable or microwaveable. Several of our respondents voiced the need for improved microwave packaging, for example:

- "Microwave trays that can selectively brown or crisp bakery products, but merely cook vegetables or meats and sauces."
- "A microwave susceptor capable of reaching a desired temperature in a short period of time (45 seconds) in any make or model of microwave oven and capable of staying at that temperature for about five minutes without self-destruction."

About 29 percent of our respondents are considering or have entered the refrigerated, extended shelf life market, with the bulk of these responses coming from the Meat, Dairy and Frozen Fruit/Vegetable/Entrees categories. However, the respondents would like to see "A reliable system to alert consumers to temperature abuse in refrigerated and frozen products."

Equipment boom

The packaging equipment business seems to be booming. All in all, our 367 respondents accounted for 2,035 equipment purchases in the past 12 months. Respondents were asked to check the types of packaging machinery their operations had purchased in the past twelve months, and whether the machinery was of foreign or domestic origin.

The greatest response came in the category of marking, coding and imprinting machines, with 54.8 percent of our respondents indicating purchases. The bulk of this equipment was bought domestically. Labelers followed with 43.3 percent purchases, again with most purchases being domestic.

The next largest group of purchases came in weighers, 38.4 percent in the past year. Almost 35 percent purchased casers; 34.9 percent, cartoners; and 34.9 percent liquid filling equipment. These were followed by inspection/detection devices (27.0 percent), filling controls (26.7 percent), non-palletizing shrink wrappers (21.5 percent) and dry product filling equipment (24.8 percent).

Domestic vs. foreign

The highest ratios of foreign to domestic purchases came in the areas of aseptic filling equipment — 7.9 percent foreign purchases to 5.7 percent domestic — thermoform/fill/seal — 5.2 percent foreign purchases to 4.9 percent domestic, and blow mold/fill/seal equipment — 2.7 percent foreign purchases to 2.2 percent domestic. When asked why they purchased foreign equipment, the most quoted responses were that the equipment was "unavailable from a U.S. manufactur-

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Respondents were asked to name the individuals (by job function) who have major influence on the following:

	Package Design			Materials Purchasing			Equipment Purchasing		
Corporate Management	66.7%	60.5%	46.2%	39.5%	23.8%	19.2%	52.6%	47.6%	41.3%
Production Management	24.6	22.4	18.3	49.1	43.5	31.7	59.6	67.3	70.2
Packaging Design	24.6	35.4	50.0	9.6	13.5	21.2	4.4	6.8	6.7
Packaging Engineers	14.9	31.3	45.2	19.3	28.6	43.3	18.4	38.1	57.7
Other Engineering	7.0	13.6	8.7	7.9	8.2	10.6	24.6	51.0	52.9
Purchasing	13.2	16.3	9.6	52.6	68.7	77.9	16.7	28.6	27.9
Marketing Management	57.0	73.5	85.6	13.2	14.3	13.5	10.5	8.7	4.8
Product Research & Development	31.6	41.5	47.1	36.0	48.1	43.3	23.7	23.8	27.9

☐ **Firms with less than 100 employees**
▨ **Firms with between 100 and 499 employees**
▩ **Firms with 500 or more employees**

Respondents were asked to check the types of machinery their operations had purchased in the past twelve months, and whether they were of domestic or foreign manufacture.

Domestic Foreign	TOTAL	MEAT PRODUCTS	BAKERY PRODUCTS	DAIRY PRODUCTS	FLAVORS/ FOOD INGREDS.	CANNED FRUIT/VEG. /ENTREES	FATS AND OILS	FROZEN FRUIT/VEG. /ENTREES	CONFEC-TIONERY PRODUCTS	CEREALS/ GRAIN PRODUCTS	BEVERAGES	OTHER FOOD PRODUCTS
Aseptic Packaging Equipment	5.7% 7.9	6.5% 9.3	3.5% 0.6	10.3% 13.8	8.7% 6.5	10.9% 14.1	2.0% 10.0	10.5% 15.8	3.4% 3.8	5.0% 12.5	11.6% 16.8	4.0% 8.0
Bag-In-Box	13.9 3.3	12.0 3.7	18.8 5.9	19.0 4.3	12.0 3.3	28.1 4.7	12.0 2.0	22.8 1.8	12.1 5.2	25.0 8.8	20.0 4.2	11.0 3.0
Blow Molding Equipment (Blow Mold/Fill/Seal)	2.2 2.7	1.9 4.6	1.2 5.9	3.4 3.4	3.3 3.3	4.7 3.1	2.0 2.0	3.5 7.0	3.4 5.2	1.3 5.0	3.2 3.2	2.0 3.0
Cartoners	33.0 5.7	40.7 6.5	37.6 7.1	38.8 8.6	28.3 5.4	39.1 7.8	24.0 6.0	43.9 8.8	48.3 13.8	45.0 8.8	35.8 10.5	33.0 5.0
Casers	34.1 5.4	29.6 8.3	38.8 5.9	39.7 5.2	30.4 4.3	43.8 12.5	34.0 6.0	36.8 7.0	41.4 5.2	46.3 7.5	41.1 7.4	33.0 7.0
Closure Handling, Application	18.0 4.1	17.6 6.5	12.9 9.4	16.4 3.4	19.6 4.3	23.4 7.8	14.0 4.0	19.3 10.5	20.7 5.2	16.3 3.8	22.1 9.5	25.0 3.0
Filling Controls	22.9 6.3	19.4 8.3	18.8 9.	31.0 10.3	30.4 7.6	31.3 10.9	28.0 6.0	22.8 8.8	27.6 12.1	32.5 8.8	29.5 9.5	26.0 6.0
Filling Equipment (Liquids)	28.1 9.5	25.0 11.1	25.9 9.4	38.8 12.1	32.6 7.6	45.3 18.8	44.0 8.0	40.4 15.8	36.2 6.9	27.5 15.0	43.2 16.8	32.0 11.0
Filling Equipment (Dry Products)	21.5 6.8	22.2 9.3	24.7 8.2	26.7 8.6	27.2 9.8	29.7 6.3	18.0 6.0	28.1 5.3	27.6 10.3	37.5 11.3	23.2 8.4	31.0 12.0
Gas Flush Systems	12.5 4.6	20.4 11.1	18.8 2.4	16.4 7.8	12.0 5.4	21.9 3.1	10.0 2.0	17.5 8.8	13.8 3.4	16.3 6.3	18.9 2.1	14.0 2.0
Horizontal Form/Fill/Seal	15.0 7.6	21.3 12.0	24.7 8.2	19.0 14.7	14.1 6.5	26.6 9.4	12.0 10.0	29.8 14.0	20.7 19.0	28.8 8.8	16.8 10.5	14.0 8.0
Inspection/Detection Devices	24.5 5.2	26.9 4.6	24.7 5.9	27.6 6.0	26.1 9.8	31.3 6.3	18.0 12.0	33.3 3.5	25.9 10.3	38.8 11.3	33.7 9.5	27.0 6.0
Labelers	36.8 9.3	39.8 13.0	38.8 8.2	39.7 9.5	39.1 6.5	35.9 21.9	44.0 12.0	35.1 14.0	37.9 15.5	37.5 11.3	28.4 22.1	33.0 12.0
Markers, Coders, Imprinters	52.0 5.4	51.9 9.3	54.1 5.9	54.3 6.0	42.4 5.4	60.9 10.9	46.0 10.0	57.9 8.8	60.3 8.6	58.7 3.8	53.7 8.4	51.0 3.0
Shrink Wrappers (Non-Palletizing)	19.9 3.3	25.9 4.6	22.4 3.5	23.3 3.4	16.3 0.0	26.6 3.1	24.0 4.0	33.3 5.3	32.8 3.4	22.5 3.8	22.1 6.3	25.0 3.0
Shrink Wrappers (Palletizing)	13.6 1.6	14.8 2.8	12.9 2.4	21.6 1.7	21.7 3.3	23.4 0.0	14.0 2.0	17.5 1.8	20.7 1.7	22.5 6.3	15.8 3.2	13.0 1.0
Stretch Wrappers (Non-Palletizing)	13.1 0.8	15.7 0.9	7.1 1.2	15.5 0.9	15.2 1.1	20.3 1.6	8.0 2.0	19.3 1.8	12.1 1.7	12.5 0.0	8.4 0.0	17.0 2.0
Stretch Wrappers (Palletizing)	18.5 1.4	20.4 3.7	20.0 2.4	19.0 1.7	17.4 3.3	29.7 3.1	12.0 4.0	17.5 3.5	17.2 3.4	31.3 2.5	24.2 1.1	17.0 3.0
Thermoform/Fill/Seal	4.9 5.2	5.6 11.1	7.1 5.9	6.9 6.0	2.2 5.4	9.4 9.4	4.0 8.0	7.0 10.5	8.6 6.9	10.0 6.3	6.3 2.1	4.0 5.0
Tray Formers	8.2 3.8	12.0 5.6	15.3 3.5	9.5 4.3	4.3 1.1	15.6 10.9	2.0 6.0	14.0 8.8	6.9 6.9	16.3 7.5	11.6 3.2	7.0 6.0
Vertical Form/Fill/Seal	12.5 6.8	10.2 8.3	18.8 8.2	11.2 6.0	15.2 7.6	17.2 7.8	14.0 4.0	8.8 8.8	22.4 8.6	28.8 13.8	10.5 7.4	15.0 5.0
Weighers	35.1 5.7	43.5 7.4	36.5 9.4	41.4 7.8	41.3 4.3	40.6 9.4	38.0 10.0	36.8 10.5	39.7 10.3	48.8 10.0	33.7 6.3	32.0 9.0
Other Packaging Equipment	29.4 13.9	34.3 16.7	31.8 12.9	28.4 17.2	23.9 10.9	31.3 17.2	32.0 20.0	38.6 19.3	29.3 25.9	31.3 18.8	28.4 18.9	35.0 17.0

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er" (34.7 percent) and that the foreign equipment was of "higher quality" (32.9 percent). Another 22.9 percent said foreign manufacturers were "more innovative."

Who decides?

One of the purposes of this year's survey was to track the packaging decision-making process. We wanted to determine how decisions are made, and who makes them. We found that an overwhelming majority of our respondents (70.3 percent) use the help of packaging and/or equipment suppliers" in making decisions. Another 10.4 percent "use consultants," while 27.8 percent "make all decisions internally." Smaller companies (less than 100 employees) are most likely to employ a consultant (12.3 percent), while the largest companies (500 or more employees) are most likely to make decisions entirely on their own (32.7 percent).

We then broke down the decision-making process in terms of "Package Design," "Materials Purchasing" and "Equipment Purchasing," and asked respondents which individuals by job function have major influence. The results indicate that Marketing Management (71.9 percent) and Corporate Management (58.3) have the most influence in package design, with Product Research & Development (40.3), Packaging Design (36.5) and Packaging Engineering Personnel (30.2), having a major voice. For Materials Purchasing, the Purchasing Department itself has the most influence (66.5 percent), followed by Production Management (42.0), Product Research and Development (39.8) and Packaging Engineers (30.0). In purchasing packaging equipment, the Production Management department (65.9 percent) has the most influence, followed by Corporate

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Appearing in the chart below are the median scores received in the categories indicated. The lower the score, the more importance placed on the category by our respondents.

Respondents ranked several factors in terms of importance when making a packaging decision.

	Total	Production Management	Engineering	Packaging
Initial Cost	3.49	3.57	4.07	3.61
Ease of Maintenance	3.69	3.49	3.81	3.90
Changeover Capability	3.92	3.96	3.77	3.90
Speed/High Volume	3.25	3.74	3.04	3.15
Payback Period	2.94	2.53	2.85	2.83
Reputation of Builder	3.79	3.79	3.53	3.63

Respondents were asked which of the following they have recently done or are considering in response to consumer demands for convenience.

	TOTAL	MEAT PRODUCTS	BAKERY PRODUCTS	DAIRY PRODUCTS	FLAVORS/ FOOD INGREDS.	CANNED FRUIT/VEG. /ENTREES	FATS AND OILS	FROZEN FRUIT/VEG. /ENTREES	CONFEC-TIONERY PRODUCTS	CEREALS/ GRAIN PRODUCTS	BEVERAGES	OTHER FOOD PRODUCTS
Converting or Extending Frozen Product Lines to Refrigerated	15.8%	34.3%	16.5%	17.2%	18.5%	21.9%	14.0%	36.8%	12.1%	13.8%	16.8%	16.0%
Converting or Extending Canned Product Lines to Refrigerated	4.6	8.3	8.2	7.8	4.3	17.2	6.0	10.5	5.2	6.3	7.4	4.0
Introducing New Shelf-Stable Products	49.6	56.5	56.5	51.7	56.5	71.9	54.0	56.1	62.1	67.5	56.8	53.0
Converting Products to Dual-Ovenable or Microwaveable	31.6	59.3	45.9	32.8	31.5	45.3	32.0	64.9	31.0	42.5	24.2	26.0
Introducing Easy-Pour or Easy-Opening Features	33.8	37.0	32.9	32.8	35.9	42.2	44.0	33.3	39.7	47.5	33.7	37.0
Entering the Refrigerated/ Extended Shelf-Life Market	28.9	44.4	27.1	44.0	34.8	31.3	32.0	45.6	22.4	32.5	29.5	28.0

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Management (47.7), Other Engineering (43.3) and Packaging Engineers (37.9).

In the accompanying chart, the results were broken down according to the size of the operation involved. For package design, the role of Corporate Management decreases with the size of the company, while those of Package Designers, Package Engineers and Marketing Management all increase. For Materials Purchasing, the influence of Production Management and Corporate Management decreases with the size of the company, while that of Purchasing and Packaging Engineering increases. For Equipment Purchasing, the role of Production Management, Package Engineering, Other Engineering and Purchasing increases with the size of the company, while that of Corporate Management decreases.

The diversity of these results indicates there is a wide variety of personnel involved in the design and purchase of packaging materials and equipment. All job functions listed have major influence in some packaging decisions. Coupled with research done for the *Packaging Status Report* (*FE* Sept., p.69), the survey results show that packaging decisions are largely a team function.

Food Engineering's exclusive Packaging Buyers Survey results make one thing clear. Food packaging is constantly becoming a more and more complex issue — too complex for any one individual to handle alone. Food processors have become reliant on a team approach for making packaging decisions. New and better packaging materials, machinery and techniques are continuously being introduced and the food industry has geared itself to assimilate them.

Respondents were asked to designate the areas in food packaging that are likely to be of importance over the next five years.

	TOTAL	MEAT PRODUCTS	BAKERY PRODUCTS	DAIRY PRODUCTS	FLAVORS/ FOOD INGREDS.	CANNED FRUIT/VEG. /ENTREES	FATS AND OILS	FROZEN FRUIT/VEG. /ENTREES	CONFEC-TIONERY PRODUCTS	CEREALS/ GRAIN PRODUCTS	BEVERAGES	OTHER FOOD PRODUCTS
Aseptic High-Acid Products	25.6%	25.0%	24.7%	31.9%	37.0%	46.9%	28.0%	42.1%	19.0%	35.0%	42.1%	33.0%
Aseptic Low-Acid/ Particulate Foods	32.7	41.7	38.8	48.3	45.7	54.7	40.0	50.9	37.9	48.8	44.2	33.0
Dual-Ovenable Packaging	32.4	56.5	49.4	39.7	31.5	43.8	34.0	66.7	36.2	46.3	27.4	27.0
Controlled/Modified Atmosphere	44.1	64.8	50.6	50.0	45.7	42.2	52.0	49.1	41.4	43.8	42.1	46.0
Barrier Plastics	59.9	63.9	58.8	60.3	60.9	70.3	60.0	54.4	48.3	63.8	54.7	69.0
Tamper-Evident Packaging	60.8	54.6	52.9	67.2	62.0	64.1	62.0	54.4	70.7	62.5	64.2	63.0
Self-Manufactured Paper Cans	6.8	5.6	8.2	3.4	6.5	7.8	4.0	3.5	5.2	7.5	11.6	12.0
Thermoforming	20.2	29.6	27.1	24.1	15.2	21.9	16.0	24.6	24.1	22.5	15.8	19.0
Developments in Flexible Packaging	45.2	51.9	50.6	48.3	48.9	46.9	40.0	45.6	53.4	62.5	35.8	48.0
Refrigerated/Extended Shelf Life Packaging	44.7	62.0	48.2	66.4	37.0	37.5	48.0	66.7	31.0	41.3	40.0	43.0
Retortable Plastic Packages	22.9	35.2	29.4	24.1	31.5	48.4	20.0	33.3	19.0	40.0	25.3	22.0
New Technology in Metal Containers	17.2	15.7	12.9	19.0	15.2	28.1	18.0	14.0	12.1	18.8	20.0	23.0
New Developments in Glass Packaging	24.3	15.7	9.4	19.8	28.3	34.4	22.0	15.8	15.5	23.8	45.3	31.0